

**Proposed Rulemaking for Effluent Limitation Guidelines and New Source Performance
Standards for the Airport Deicing Category
74 Fed. Reg. 44,675 (August 28, 2009)
Docket No. EPA-HQ-OW-2004-0038**

**AFFIDAVIT OF DAVID ISHIHARA
Massachusetts Port Authority**

I, David Ishihara, declare that the following statements are true and correct:

1. I am the Director of Aviation Operations at Edward Lawrence Logan International Airport (Boston-Logan) for the Massachusetts Port Authority. I have been in this position for three years. Before that, I was employed by the Department of Homeland Security/Transportation Security Administration, the Federal Aviation Administration, and was the Assistant Airport Manager at the Portland International Jetport, Portland, Maine. I have a total of 10 years of experience in aviation management.

2. I have a Bachelor of Science Degree from Florida Institute of Technology where I studied aviation management. I also hold FAA commercial, instrument, and flight instructor pilot certificates. I am a member of the American Association of Airport Executives, Airports Council International-North America, and the Aircraft Owners and Pilots Association.

3. As the Director of Aviation Operations, I supervise four groups: Airport Operations (which deals with airfield safety and compliance with FAA Part 139 regulations); Facilities (whose duties include snow removal); Aviation Security; and Public Services. Vincent Cardillo is the Deputy Director of Airport Operations; under him is the Airside Manager, Robert Lynch. Both Mr. Cardillo and Mr. Lynch have extensive experience in airport operations, including many years at Boston-Logan.

Boston-Logan Airport Operations

4. On a typical day at Boston-Logan, there are approximately one thousand (1,000) aircraft operations, divided nearly evenly between departures and arrivals. The busiest times of operation are from about 6:00 A.M. – 9:30 A.M. (with a peak from 8:00 – 9:00) and from about 2:30 P.M. – 7:00 P.M. (with a peak from 6:00 – 7:00). Boston-Logan is primarily an “origin and destination” airport, meaning that most passengers either begin or end their air travel itinerary at Boston (versus hub airports at which passengers connect with other flights to reach their ultimate

destination). Boston-Logan serves a wide variety of markets including nearby and small New England markets, major business centers in the Northeast, large hub airports throughout the US and international destinations. As a result, the airport accommodates a wide variety of aircraft sizes from light twin engine aircraft such as Cape Air Cessna 402s to long-haul wide bodies such as Boeing 747/777/767 and Airbus A340/A330. In 2008, Boston-Logan ranked 20th among North American airports (19th of U.S. airports) in total passenger throughput (26,102,651) and 21st among North American airports (20th of U.S. airports) for total number of operations (371,604).¹

5. Boston-Logan's airfield is situated three miles from downtown Boston, surrounded on three sides by Boston Harbor and densely populated neighborhoods on the fourth side. As an older commercial airport, Boston-Logan is highly space-constrained. Boston-Logan's 1,751 acres of land are virtually fully occupied by the existing airfield, terminals, roadways, parking garages and other supporting infrastructure. Boston-Logan's footprint is small given the high volume of air traffic it accommodates - far smaller than other international airports in the snow-belt, including Chicago O'Hare with 10,000 acres and Denver with 33,000 acres. There is a severe dearth of space available for any development or expansion at Boston-Logan. As shown in Figure 1, Boston-Logan's location makes geographic expansion virtually not possible.

6. The layout of the Boston-Logan airfield is shown in Figure 2. Boston-Logan has six runways. Each runway operates in two directions and is named by the compass headings of those directions. Parallel runways having the same compass heading are designated "right" and "left." Boston-Logan's six runways are 4L/22R, 4R/22L, 15L/33R, 15R/33L, 14/32, and 9/27. See Table 2 for statistics on each runway.

7. The FAA determines runway usage at Boston-Logan according to wind conditions and several other factors. Aircraft must generally take off and land into the wind, especially as wind speeds increase. For safety and efficiency, the FAA prefers to have at least three runways available for use at Boston-Logan and prefers to separate arrivals from departures by using different runways for each. Moreover, if possible, FAA prefers to separate large and small planes on different runways (due to wake turbulence from large planes and varying aircraft approach speeds). Other factors that FAA air traffic controllers consider in determining runway usage at Boston-Logan include: length of runways (heavier planes need longer runways), runway

¹ Airports Council International 2008 Airport Traffic Report, http://www.aci-na.org/stats/stats_traffic.

usability for instrument landings, and noise restrictions (for example, jets are not allowed to arrive on 22R or to depart on 4L).

8. Wind conditions at Boston-Logan are highly variable, with wind directions ranging around all points of the compass. This requires a more complex runway layout than at airports with less variable winds. Figure 5 shows the average percent of time, over the course of a year, during which the wind blows from each of the four quadrants of the compass (northeast, southeast, southwest, and northwest). The following runway configurations (depicted graphically in Figure 6) are typically used during each of these wind conditions:

- a. In a northeast wind, arrivals are on 4L and 4R, and departures are from 4L (not jets), 4R, and 9. This is the most common configuration during deicing conditions.
- b. In a northwest wind, both arrivals and departures are on 27 and 33L; if the wind is greater than 10 knots, Boston-Logan is allowed to use its new runway 14/32 for smaller aircraft. This is the second most common configuration during deicing conditions.
- c. In a southeast wind, arrivals are on 15R and departures are from 15R and 9. This is the third most common configuration during deicing conditions.
- d. In a southwest wind, arrivals are on 22L and 27, and departures are from 22L and 22R. This configuration may be in use when morning deicing of frost is necessary.
- e. In certain weather conditions, only one runway is used for both arrivals and departures. In heavy snow and/or low visibility, 4R is normally the runway used; in strong winds, the runway facing most directly into the wind is used.

9. Boston-Logan's space constraints, as well as the weather/wind and operational conditions described above, have necessitated a layout in which runways and taxiways cross each other in many locations. Boston-Logan's complex airfield system demands enhanced safety precautions to prevent runway incursions. FAA defines a runway incursion as "[a]ny occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing and takeoff of aircraft."² Any operational requirement (such as aircraft taxiing to and from deicing pads) that adds to the number of times aircraft must cross active runways or spend additional time on the active airfield, contrary to typical FAA procedures, could adversely affect safety margins, which is inconsistent with Massport and the FAA goals of reducing these occurrences. Boston-Logan has experienced an

² Federal Aviation Administration, *Annual Runway Safety Report 2009*, at 4.

increase in incursions in recent years and is working closely and tirelessly with the FAA and other technical experts (as part of an FAA-instituted “Tiger Team”) to implement measures that are designed to reduce runway incursions.

10. Deicing aircraft and airfield pavement is critical to ensuring safe flight operations during winter weather. The FAA’s “clean aircraft concept” and associated guidance require that all critical surfaces of an aircraft be free of frost, ice, or snow at take-off. Achieving and maintaining these critical conditions during winter weather requires “deicing,” the removal of frost, snow, and ice, sometimes followed by “anti-icing,” which prevents the development of further accumulations for a limited period of time (i.e., holdover time). These processes are accomplished with a combination of physical removal techniques and application of specialized deicing and anti-icing products.

11. Deicing is typically conducted at Boston-Logan from October or November through March or April. Massport is primarily responsible for snow removal and pavement deicing on runways, taxiways, ramp areas, roadways, and public sidewalks; some tenants conduct limited snow removal and deicing of their own ramp areas. During a snowstorm, Massport’s runway clearing team typically consists of ten plows, two or three snow blowers, three chemical trucks, and one or two supervisor vehicles; the taxiway team typically consists of six to eight pieces of equipment. Massport recently switched from use of a glycol-based product for pavement deicing to potassium acetate.

12. Aircraft deicing at Boston-Logan is conducted by individual airlines (or their contractors) and its sole fixed-base operator (Signature Flight Support), according to airline-specific protocols and FAA guidelines. Aircraft deicing is primarily conducted at the gates and tenant apron areas. A limited amount of deicing takes place at Juliet Pad, a paved area bounded by Taxiway J and Runway 14, which can accommodate five narrow-body planes. Juliet Pad is typically used when Boston-Logan is in a configuration using Runways 4L, 4R and 9; it is normally closed during significant snowstorms, when the snow removal crew must focus on keeping the runways clear. De-icing at the gates with additional capability at Juliet pad, when appropriate, provides the best operational flexibility for airlines and has the added advantage of limiting the number of aircraft that are taxiing on the airfield to only those that are ready and cleared for take-off or have just landed.

Safest and Most Functional CDF Locations

13. If all aircraft at Boston-Logan were required to be deiced at remote Centralized Deicing Facilities (CDFs), that is, away from contact gates, as full compliance with the proposed EPA rule would require, safety and operational considerations dictate that the CDFs should be located at the end of each set of departure runways. This would necessitate three separate CDFs: one on the north side of the airport to serve runways 22L, 22R, and 15R (“North Pad”); one on the east side of the airport to serve runways 33L and 27 (“East Pad”), and one on the south side of the airport to serve runways 4L, 4R, and 9 (“South Pad”). Runways 14, 15L, and 33R are minimally used during deicing conditions. The necessary locations of these three deicing facilities are shown in Figure 7. These facilities would be used as follows:

- a. In a northeast wind with departures from 4L, 4R, and 9, aircraft would use the South Pad;
- b. In a northwest wind with departures from 27 and 33L, aircraft would use the East Pad;
- c. In a southeast wind with departures from 15R and 9, aircraft would use the North and South Pads; and
- d. In a southwest wind with departures from 22L and 22R, aircraft would use the North Pad.

14. There are three primary reasons why three separate CDFs would be needed to assure safe and functional compliance with EPA’s proposed rule. The first reason to locate pads at each set of runway ends would be to minimize any additional taxiing, because increased taxiing distance increases the potential for runway incursions. Currently, each plane is deiced at its gate and then taxis directly to its departure runway. If an aircraft is required to taxi from its gate to a CDF located at one part of the airport, then taxi to a departure runway in another part of the airport, the number of runways it crosses while taxiing (and thus the number of potential runway incursions) greatly increases. Further, the increased taxiing time delays the departure time. If the deicing pad is located near the end of the departure runway, taxiing distance is only slightly increased above current conditions, and the increased likelihood of an incursion is minimized.

15. The second reason to locate deicing pads at each set of runway ends would be to minimize the time between deicing/anti-icing and departure. Pursuant to FAA Advisory Circular 120-60B, aircraft have a limited timeframe after being deiced/anti-iced within which to take off

safely . That timeframe is called the “holdover time.” Holdover times in some conditions are only a few minutes, so planes must be able to get from the deicing area to the departure runway within that period of time.

16. The third primary reason pads are best located at runway ends would be to prevent pad use from interfering with runway use. It would be extremely difficult, if not impossible, to locate one centralized pad at Boston-Logan that did not cause intrusion into the airspace necessary for safe operation of one or more runways, under the protected surfaces provisions of Part 77 of the FAA Regulations.

17. However, even with three CDFs, the requirement to deice all aircraft at CDFs would still cause operational and safety problems at Logan. Planes would still have to taxi from the gate to the pad before being deiced, with only very minimal deicing (25 gallons) allowed at the gate under the proposed EPA rule. This poses a safety hazard from planes taxiing covered with ice and snow. Further, sending both large and small planes to the same pad is problematic, because jet blast presents a hazard to small planes.

Operational Problems with Pad Locations on Existing Land at Boston-Logan

18. Because the construction of two new CDFs in Boston Harbor (Figure 7) is impracticable and their environmental permitting exceedingly unlikely (see the Affidavit of Stewart Dalzell), Massport has considered the feasibility, from an operations and safety standpoint, of the other potential pad locations on Boston-Logan property identified by its professional airfield consultants.

19. Aircraft operations on the recently constructed centerfield taxiway, Taxiway M, effectively eliminate any possibility of conducting deicing operations anywhere in the area between Runways 4L/22R and 4R/22L.

20. General aviation and cargo aprons are too far from the departure end of the runways for a CDF location, and are congested with ground service equipment and aircraft.

21. The Governors Island area, between the approach ends of Runways 4R and 32, was previously used as a disposal area for excavated material from the Central Artery/Tunnel Project. The area is elevated above the surrounding runway centerline by approximately five feet, and above the airfield perimeter road by approximately ten feet. Placing a CDF in this area would

interfere with FAA aeronautical navigational aid equipment installations and with FAA-established critical surfaces.

- a. This pad would be redundant to a proposed expanded Juliet Pad, since the Juliet Pad would be used if Runway 4R was active.
- b. Importantly, there are Runway and/or Safety Area crossings that would be unavoidable for aircraft and vehicles traveling to/from this pad, which is a significant airfield safety concern.
- c. Existing and Future Navigational Aid Impacts: This area is within the Airfield Surveillance Radar (ASR-9) critical area. The height of the aircraft on the deicing pad could interfere with the radar sweep plane, and windblown deicing fluid could negatively affect the ASR facility. This area is also just beyond the Instrument Landing System (ILS) glide slope critical area for the Runway 4R glide slope, which is the primary instrument arrival runway used during inclement weather; deicing operations could impact the 4R glide slope signal deflection.
- d. FAA Critical Surfaces Impacts: The Governors Island CDF location is near the approach end of Runway 4R, which is designated for instrument landings and thus has imaginary surfaces that must be considered and analyzed before a deicing pad is proposed.

22. The Taxiway C area, midfield between Taxiways C, F, and G and Runway 4R/22L, has the following operational issues:

- a. The proposed layout requires integration into Massport's plans to realign Taxiway G and the Taxiway C Hold Apron. Accommodating the Taxiway G realignment results in a small deicing pad for only two or three aircraft. This location would be useful for Runway 33L or Runway 27 departures; however, it does not meet required overall deicing capacity needs and would, therefore, have to be used in conjunction with another alternative.
- b. Construction of a remote deicing facility in this area would require aircraft to cross, depending on taxi route, no fewer than two runways en route to the deicing pad, increasing the opportunity for runway incursions, particularly under the poor visibility conditions that typically accompany winter storms. This location is also logistically difficult for ground equipment, such as deicing vehicles, to reach and

would also require multiple runway crossings, again increasing to the opportunity for runway incursions and vehicle/aircraft incidents and accidents.

23. Juliet Pad: The area is a paved area bounded by Taxiway J on the north and west side, Runway 14 on the south side, and Taxiway J1 to the east. The area is currently used for deicing and could be expanded into the Runway 14 overrun area.

a. FAA Critical Surfaces Impacts:

- i. Juliet Pad cannot be used when Runway 14/32 is open, because aircraft in deicing positions violate safety area and object free area criteria, and Runway 14 is used as a taxiway during deicing. In addition, vertical objects on Juliet Pad penetrate critical airspace surfaces for Runway 9/27, so Juliet Pad cannot be in use when Runway 27 is active or when Runway 9 is being used for arrivals. These runway incompatibilities pose a significant problem at the tail end of storms, when northwest wind conditions often dictate the usage of Runways 27 and 32.
- ii. Because of these runway incompatibilities, only temporary mobile equipment could be used for deicing at Expanded Pad Juliet. Any time the FAA required the opening of any of the runways incompatible with the use of Juliet Pad, all aircraft, vehicles, equipment, and other objects would have to be immediately removed from the pad. If the pad could not be cleared in the necessary time, disruption of air traffic control and safety concerns would result.

b. Operational Issues:

- i. There is limited space available on and near Juliet Pad, which would be a problematic for aircraft movement, particularly in the event of Group V aircraft deicing. A primary problem is the need for an area for aircraft queuing, since aircraft must be moved from contact gates to allow arriving aircraft to use those gates for disembarking passengers. Otherwise, in addition to the outbound departure delays that would certainly result from aircraft waiting in line for deicing, inbound arrival delays would occur. Aircraft must also be able to return to a gate from the queuing area in a number of relatively common events, including: a crew exceeding its allowed

hours, or if passengers must be returned to the terminal due to exceedance of time on the ground under new Department of Transportation regulations.)

Ground control must position waiting aircraft on taxiways, leading to congestion. Queuing on taxiways also impedes Massport's ability to clear snow from taxiways and to access runways to clear them.

- ii. Juliet Pad is distant from the departure ends of Runways 22R, 22L, 27, and 33L. The increased taxi time to these runways increases the possibility that an aircraft will exceed its holdover time before takeoff, forcing it to return to the pad to be de-iced again. In addition, the routes would involve more crossings of runways and/or taxiways and might create two-way traffic on taxiways, all of which have congestion and safety implications.
- iii. I have reviewed the maximum build-out design of the Expanded Juliet Pad completed by CH2M Hill. I have also reviewed deicing information provided by Logan air carriers and consulted with Mr. Cardillo and Mr. Lynch. Based on this information and using my professional judgment, I estimate that aircraft would spend an average of 15-20 minutes on this pad during light deicing conditions (including deicing time as well as time to maneuver, configure the aircraft for deicing, and complete checks with the deicing team, ground control, and air traffic control). Based on this dwell time and peak hour departures, Expanded Juliet Pad cannot accommodate all current and future throughput without delays.
- iv. There are a number of problems caused by delay that are specific to Boston-Logan. Boston-Logan, as an "origin and destination" (rather than hub) airport, has a balanced flow of arrivals and departures, so constraints on departures will affect arrivals. Also, because people are often flying from Boston-Logan to hubs, departure delays may cause them to miss their connecting flight. In addition, for international flights out of Boston-Logan, there is often only one flight per day to a particular destination.
- v. The need to rely on mobile equipment would cause substantial logistical problems. Without fixed storage tanks for water and deicing fluids, vehicles would have to leave the pad to refill their tanks, resulting in delays, increased

congestion, and safety concerns. Also, given Logan's space constraints, it would be difficult to find a location near the pad to store all of the mobile equipment.

- vi. Some of the marking required to delineate taxi paths and deicing positions on the pad would conflict with FAA requirements regarding runway and taxiway marking. Logan would have to use temporary markings for deicing or obtain a modification to standards from the FAA.
- vii. The Amelia Earhart Terminal was once occupied by Signature Flight Support followed by American Eagle Airlines. It is currently used as a facility for international diversions, for sequestering aircraft involved in an emergency event, and humanitarian flight missions. This facility, its associated ramp and apron and the ramp along Taxiway Juliet cannot be discounted for regular, full-time use. Its operation and utility require direct and unimpeded access by aircraft for enplaning/deplaning of passengers.

24. Corroborating the above analysis, a Geographic Information Systems evaluation of land on the airfield that could be developed without interference with runways, taxiways, or navigational aids identified only a tiny piece of land (Figure 3).

25. Moreover, the use of any of the infield (grassland) areas on the airfield is further constrained, because almost the entire airfield is designated at the state level as "Priority Habitat of Rare Species" and therefore regulated under the MA Endangered Species Act (321 CMR 10).

Executed this 24th day of February, 2010.



David S. Ishihara

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**AFFIDAVIT OF RICHARD BESSOM
Massachusetts Port Authority**

I, Richard M. Bessom, declare that the following statements are true and correct:

1. I am the Program Manager for Horizontal Projects at Logan International Airport for the Massachusetts Port Authority. I supervise six Project Managers in the Capital Programs and Environmental Affairs department who manage the design and construction of many horizontal capital projects such as runways, roads, utilities, and storage yards. I have served in this role with the Authority for four (4) years. From 1985 until I began my current position, I was a Project Manager in the same department, managing design and construction projects. In total, I have over thirty (30) years of engineering experience.

2. I received a Bachelor of Science degree in Civil Engineering from the University of Rhode Island in 1980. I am a Professional Engineer licensed in the Commonwealth of Massachusetts and a Certified Construction Manager. I am a member of the Construction Management Association of America, the American Society of Civil Engineers, and the Boston Society of Civil Engineers.

3. I have overseen the design and construction of numerous capital projects for the Authority, including the following:

a. The aboveground fuel storage facility at Logan Airport. This facility, constructed in 1997 and 1998, consists of four (4) above-ground pile-supported storage tanks, each tank capable of storing 42,970 barrels (1,804,740 gallons) of fuel for a total storage capacity of 7,218,960 gallons. Collocated with the storage facility is a small one-story

operations and control building to monitor the product levels and provide testing, storage, etc. There are also two offloading facilities where tankers can deliver product to the tank farm and offload into the above ground tanks.

b. The new Runway 14-32 and associated taxiways at Logan Airport. This was a \$50M construction effort that included removal of two cargo buildings, relocation of taxiways, and construction of a new 5,000 foot runway with safety areas at each end.

c. The preliminary designs of other new or reconfigured taxiways at Logan Airport with construction values totaling approximately \$67M.

Space Constraints

4. Logan Airport is extremely space constrained. It consists of approximately 2,370 acres, of which approximately 1,751 acres are land. Logan is surrounded by water on three sides and bordered by a dense urban neighborhood on the fourth side. Logan has six runways and close to twenty miles of taxiways. Because of the complex layout of runways and taxiways, most of the airfield movement area is subject to FAA prohibitions on structures within specified areas around and above runways. FAA airspace restrictions limit the possible height of buildings and other structures at Logan. In the non-movement area, there is no vacant property within the airport boundary. The last developable area, the North Service Area, is slated for construction of a facility for maintenance of Massport buses. In addition, there is essentially no surface parking at the airport; all parking is in multi-level garages.

5. I have reviewed the technical report by Camp, Dresser & McKee (CDM), titled "Deicing Runoff Storage Analysis" and dated February 2010, regarding runoff storage volumes that would be needed under two deicing runoff collection scenarios.

6. According to the CDM report, if deicing runoff were collected just from a centralized deicing facility located at Juliet Pad, 4.3 million gallons (MG) of storage tank capacity would be required. In my professional judgment, based on my experience with the aboveground fuel storage facility project and my knowledge of Logan Airport, it would be very difficult or impossible to site storage tanks of this volume at Logan. They could not be sited above ground without displacing an existing or planned airport-related function located on site. Constructing underground storage tanks would be an enormous engineering challenge, due in part to the high water table at Logan, and would result in displacement for the duration of construction (if not permanently) of the functions conducted above ground at the site. Further, the costs of constructing underground tanks would be exorbitant, potentially hundreds of millions of dollars.

7. The CDM report also states that if Logan were to collect all deicer-containing stormwater under current conditions (gate deicing with runoff to the North and West Outfalls), 94.2 MG of storage tank capacity would be required. Given the difficulty described above for siting 4.3 MG of storage capacity, it is my professional judgment that siting 94.2 MG of storage capacity at the airport would be completely infeasible.

8. I have also reviewed a technical report by Gresham, Smith and Partners, titled "AFB Treatment Applicability Review" and dated February 23, 2010, regarding on-airport treatment of deicing runoff with an anaerobic fluidized bed (AFB) treatment system. Based on the report's estimate that such a treatment facility would have a footprint of approximately 6 acres, it is my professional judgment that it would be infeasible to site such a treatment system at Logan, for the reasons discussed above.

Construction Costs

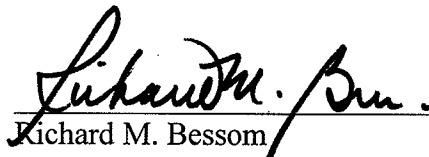
9. The costs of large construction projects at Logan are significant.

10. For example, costs for the fuel tank farm constructed in 1997-1998 were approximately \$27,000,000. In 2010 dollars, using a 4% escalation factor, this would be approximately \$47,000,000. Based on these costs, it is my professional judgment that construction of a tank farm for storage of 4.3 MG of deicing runoff, if it were possible to construct it above-ground at Logan, would cost approximately \$28,000,000 today. This does not include any treatment facility. This also does not include any underground distribution piping to a treatment facility or from a deicing area (i.e., everything would be trucked to/from the storage tanks). Construction of a above-ground tank farm for storage of 94.2 MG of deicing runoff, leaving aside all feasibility issues, would likely cost in excess of \$600 million.

11. Another example project is the 33L Runway Safety Area slated for construction in 2011. That project involves constructing a pile-supported deck approximately 300 feet wide and 400 feet long. Construction costs alone of this deck are projected to be approximately \$60,000,000.

12. I have reviewed the report by CH2M Hill, titled "Analysis of Centralized Deicing Pad Feasibility at Logan International Airport" and dated February 2010, regarding construction of deicing pads at three locations at Logan. In my professional judgment, the costs estimated for constructing these deicing pads are reasonably accurate, given the many uncertainties involved.

Executed this 24th day of February, 2010.


Richard M. Bessom

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Docket No. EPA-HQ-OW-2004-0038**

**AFFIDAVIT OF STEWART DALZELL
Massachusetts Port Authority**

I, Stewart Dalzell, declare that the following statements are true and correct:

1. I am Deputy Director of Economic Planning and Development for the Massachusetts Port Authority (the Authority). I oversee the Authority's efforts to obtain the environmental permits and approvals for the Authority's development projects. I am also involved in community outreach in connection with the Authority's proposed development projects. I have served in this role with the Authority for nearly 10 years and have over 20 years additional experience in preparing local, state and federal environmental filings including both aviation and marine projects in my prior position. I have a Bachelor of Science in Biology from Springfield College in 1977.

2. I am on the Steering Group for the Environmental Affairs Committee of Airports Council International – North America (ACI-NA), a trade group whose members are proprietors of the large commercial airports in the United States. In this capacity I participate in the development of ACI-NA's position on a range of environmental permitting matters affecting airports across the United States. I served as Committee Chair for 2008 and 2009 and currently sit on the ACI World Environmental Standing Committee, representing North America.

3. I have overseen the environmental permitting of over 25 capital projects for the Authority, including projects in or near Boston Harbor.

4. I am currently directing the Authority's effort to obtain the permits necessary to construct runway safety area (RSA) improvements at the ends of Runways 33L and 22R at Boston-Logan

International Airport. These improvements will extend both RSAs to provide overrun and undershoot protection and are required to comply with FAA's runway design criteria and to facilitate rescue efforts in the event of an aircraft emergency. In the nearly 20 years that I have worked on projects at Logan either on staff or as a consultant, the current RSA project is the most complicated permitting project I have encountered from an environmental resources impact and mitigation perspective. This project is being carefully reviewed by senior resource and permitting agency scientists because of the sensitive nature of the coastal resources potentially affected. To date, Massport has spent over three years refining alternatives to minimize the impacts of this high priority safety project and we would expect another 1-2 years of analysis, public and agency review before construction could commence. Direct and indirect impacts to the harbor and intertidal resources related to the Runway Safety Areas project total fewer than five (5) acres, portions of which involve filled land. The RSA improvements project is expected to incorporate extraordinary measures to avoid and minimize impacts, most notably construction of a pile-supported deck (capable of supporting a fully-loaded Boeing 747-400 in the event of an emergency takeoff or landing) rather than a filled structure. Even with the significant measures that will be taken to avoid and minimize adverse impacts of the required safety improvements, this project requires at least seven different local, state and federal environmental approval processes, including rarely issued variances under the Massachusetts Wetland Protection Act and the Commonwealth's Tidelands (Chapter 91 of the Massachusetts General Laws) regulations.

5. I have reviewed CH2MHill's report titled "Analysis of Centralized Deicing Pad Feasibility at Logan International Airport" and dated February 2010, as well as the Affidavit of David Ishihara, Director of Aviation Operations. Based on these documents, I understand that it would be necessary to construct two new deicing pads, one at the end of Runway 22R (North

Pad), the other at the end of Runway 33L (East Pad), to deice all planes departing from Logan without unacceptable delays or safety risks. Because there is insufficient room for either of these new pads given the current geographic boundaries of Logan, they would require filling in portions of Boston Harbor tidelands to accommodate them. Based on calculations prepared by CH2MHill, the East Pad would require the filling or alteration of approximately 3,330,570 square feet (for both pad and support area), the equivalent of approximately 76 acres. The North Pad would require another 3,609,660 square feet of filling or alteration of tidal flats or approximately 83 acres. Together, both pads would require the filling of approximately 159 acres of Boston Harbor tidelands. The potential impacts associated with the fill and construction needed to fulfill the deicing requirements are orders of magnitude greater than those from the Authority's proposed RSA improvements.

6. A request for environmental permits to fill 83 acres of Boston Harbor for one new deicing facility, let alone filling of 159 acres for two facilities, would be unprecedented in the modern era of state and federal environmental regulations. It would require at least ten (10) permits and approvals from state and federal agencies, including but not limited to the following: Record of Decision under the National Environmental Policy Act; Secretary's Certificate under the Massachusetts Environmental Policy Act; Army Corps of Engineers Section 404 and Section 10 permits; EPA's NPDES General Permit for Stormwater Discharge from Construction Activities; Section 401 Water Quality Certificate from DEP; both a variance and Order of Conditions from DEP under the Massachusetts Wetlands Protection Act; Variance/Waterways Permit from DEP under G.L. c. 91; Massachusetts Coastal Zone Management Office Consistency Certification; and FAA Airport Layout Approval.

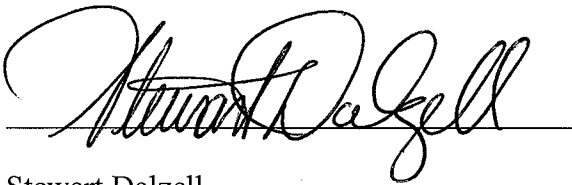
7. In my professional opinion, obtaining the necessary permits and approvals to fill 83 acres of tidelands in Boston Harbor for one new deicing facility, let alone 159 acres for two facilities, is not achievable. For instance, it is highly improbable that the Authority could satisfy the state and federal wetland laws requiring applicants to avoid, minimize and mitigate all wetland alteration. A harbor fill project of this magnitude, while unprecedented in my experience, would also likely face insurmountable mitigation challenges, including more than one-for-one replacement of all wetland and tidelands that are eliminated. Because of the substantial impacts to the coastal biota and marine processes that would be expected to result from a project of this size, there would be significant ecosystem-wide resource and habitat impacts. These impacts would need to be mitigated in the immediate areas of impacts. I cannot conceive of how that could be realistically achieved. The Authority is already facing many challenges identifying suitable mitigation strategies for the RSA project which involves only a fraction of the impacts that would be associated with the construction and operation of the deicing concepts.

Developing mitigation strategies is especially challenging for Massport at Logan Airport due to the existing dense development within the region and is further complicated by strict FAA regulations regarding mitigation near airports that pose wildlife hazard/bird strike risks. Thus, Massport providing 159 acres of replacement wetland is impracticable. By comparison, as noted above, the Authority will spend nearly \$3 million over 5+ years to permit the alteration of fewer than 5 acres of Boston Harbor tidelands for the RSA (see ¶ 4 above) which is less than 5% of the alteration/fill that would be required to construct the two new deicing facilities.

8. In my professional opinion, deicing pads are not likely to be considered a permissible water-dependent use that would allow the Authority to use the Commonwealth's tidelands under the Massachusetts G.L. c. 91 regulations.

9. Filling 159 acres of Boston Harbor tidal flats would require substantial alteration and would cause substantial harm to tidal flats in Boston Harbor, including shellfish beds, eelgrass and breeding and foraging habitat for numerous marine species. In my professional opinion, this harm would, by any reasonable measure, be far greater than the benefits to Boston Harbor water quality that might result from reducing glycol discharge into the Harbor in accordance with EPA's proposed rule.

Executed this 23rd day of February, 2010.

A handwritten signature in black ink, appearing to read "Stewart Dalzell", written over a horizontal line.

Stewart Dalzell

*ANALYSIS OF CENTRALIZED
DEICING PAD FEASIBILITY AT
LOGAN INTERNATIONAL AIRPORT*

Prepared for
Massachusetts Port Authority

February 24, 2010

Prepared by
CH2MHILL

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I. INTRODUCTION

This technical memorandum evaluates the feasibility of siting and constructing a centralized deicing pad at Boston's Logan International Airport ("Logan") that would comply with the United States Environmental Protection Agency's ("EPA's") proposed Effluent Limitations Guidelines and New Source Performance Standards for the Airport Deicing Category¹ (the "Proposed Rule") and Federal Aviation Administration ("FAA") requirements relating to aircraft deicing and airport and centralized deicing pad design and operation.

Specifically, this memorandum: (1) estimates the pad capacity that Logan would need to accommodate its existing and its projected 2020 fleet mix and operations at such a centralized deicing pad (i.e., the number of pad deicing positions that would be required to deice all aircraft departing Logan during weather conditions requiring deicing, as would be required by the Proposed Rule²); (2) assesses what usable space is available, if any, within Logan's geographic boundaries for the location of such a centralized deicing pad; (3) evaluates the feasibility of several potential centralized deicing pad locations; (3) identifies the primary operational constraints and constructability issues associated with these locations; and (4) calculates the rough order of magnitude costs that Massport would incur to construct one or more centralized deicing pads at Logan that complies with both the Proposed Rule and FAA requirements.

This memorandum concludes that Logan would only be able to meet both the Proposed Rule's requirement for centralized deicing pad deicing of all departing aircraft during all weather conditions requiring deicing (i.e., the Proposed Rule's requirement for "100 percent throughput") and FAA requirements if it were to construct three centralized deicing pads to the north, east and south of Logan's terminal areas near the ends of each set of major runways – at a total cost of over \$1.56 billion. The southern pad could be an expanded version of "Juliet Pad," an existing paved area bounded by Taxiway J to the north, Runway 14 to the south and Taxiway J1 to the east that is currently used for off-gate deicing by a limited number of airlines and deicing service providers. However, because of the space constraints imposed by Logan's geographic boundaries, the northern and eastern pads would require the filling of approximately 160 acres of Boston Harbor tidelands. The memorandum further concludes that an expanded Juliet Pad would not enable Logan to meet the Proposed Rule's 100 percent throughput requirement, and presents a number of operational issues.

¹ EPA-HQ-OW-2004-0038 FRL-8948-2, 74 Fed. Reg. 44,676 (Aug. 28, 2009).

² See 74 Fed. Reg. at 44,718 (proposed 40 C.F.R. § 449.20(b)(1)(ii)(A), which would require that "[a]ll aircraft deicing shall take place on a centralized deicing pad, with the exception of deicing for safe taxiing").

II. BACKGROUND

A. Summary of Proposed Rule

In the Proposed Rule, EPA has proposed technology-based effluent limitation guidelines and new source performance standards under the Clean Water Act (“CWA”) for discharges from airport deicing operations. The Proposed Rule generally would apply to wastewater (including stormwater) associated with the deicing of aircraft and airfield pavement at primary commercial airports.³

Under the Proposed Rule, airports with 10,000 or more annual departures would be required to collect applied aircraft deicing fluid (“ADF”) and treat the associated wastewater to a specified numeric effluent limit prior to discharge pursuant to a CWA National Pollutant Discharge Elimination System (“NPDES”) permit. At those airports with annual normalized usage of 460,000 or more gallons of ADF, EPA would require the collection of 60 percent of “available ADF,” with centralized deicing pads identified as the “best available technology economically achievable” (“BAT”) for 60 percent collection. EPA has proposed three methods by which such airports can demonstrate compliance with this ADF collection requirement: (1) certification that the airport is operating its centralized deicing pad(s) in accordance with EPA-mandated technical specifications; (2) use of an EPA-approved alternate ADF collection technology; and (3) appropriate periodic monitoring in accordance with an EPA-approved monitoring program.⁴

B. Logan’s Current Deicing Practices

At Logan, aircraft deicing is the responsibility of the individual airlines and is conducted by either the airline or an on-site fixed base operator (“FBO”) using Society of Automotive Engineers (“SAE”)-certified propylene glycol- or ethylene glycol-based products.⁵ The majority of aircraft deicing at Logan currently is performed in the terminal gate areas. Two airlines also use an off-gate location, the existing Juliet Pad, a bituminous paved area in the southern portion of the airfield that is bounded by Taxiway J to the north, Runway 14 to the south and Taxiway J1 to the east. One airline uses a vehicle to collect spent ADF from apron surfaces during dry weather deicing activities. Recovered fluids are discharged to the sanitary sewer under a permit with the Massachusetts Water Resources Authority (“MWRA”). Other spent ADF is not recovered.

The primary pathway for deicing runoff to reach surface waters is the discharge from Logan’s stormwater outfalls. More than 97 percent of aircraft deicer use at Logan occurs within the drainage areas of the North and West Outfalls. Under Logan’s current NPDES permit, and based on periodic water quality testing, EPA authorizes discharges of

³ 74 Fed. Reg. at 44676.

⁴ 74 Fed. Reg. at 44691-44692, 44701.

⁵ Type I ADFs are used for removing frost, ice, and snow from aircraft surfaces; they are applied at various mixture strengths, depending on air temperature and deicing application equipment capabilities to adjust the mixture. In addition, Type IV anti-icing fluids are used as required to keep those surfaces free of frost, ice, or snow prior to an airplane taking off; Type IV products are applied without dilution.

stormwater to Boston Harbor, Boston Inner Harbor and Winthrop Bay from 49 stormwater outfalls: five main outfalls (North 001, West 002, Porter Street 003, Maverick Street 004, and Northwest 005) and 44 smaller outfalls that drain the runways and the perimeter area of the airport (outfalls A-1 through A-44). The outfalls receive drainage from the five large developed or terminal drainage areas (North, Northwest, West, Porter Street, and Maverick Street) and the remaining airfield drainage areas. The North Outfall discharges to tidal marshes in Winthrop Bay on the north side of Logan. The West Outfall discharges alongside the Porter Street outfall to the main Boston Inner Harbor channel on the southwest side of Logan.

III. POTENTIAL CENTRALIZED DEICING PAD OPTIONS FOR COMPLIANCE WITH THE PROPOSED RULE AND FAA REQUIREMENTS AT LOGAN

A. Centralized Deicing Pad Capacity/Sizing

To evaluate the feasibility of a centralized deicing pad at Logan that would comply with the Proposed Rule (including the proposed 100 percent throughput requirement) and FAA requirements, it was first necessary to determine the number of deicing positions that such a pad would need to accommodate Logan's current and projected 2020 fleet mix and peak hour departure schedule.

1. Data and Assumptions

For this capacity analysis, CH2M HILL used the following data and made the following assumptions:

- The January 2010 Official Airline Guide ("OAG") schedule for January 20, 2010, along with cargo and general aviation ("GA") traffic estimates,⁶ were used to determine a representative current fleet mix and a representative current peak hour departure rate of 41 aircraft per hour for Logan.
- The year 2020 was selected as the representative future year for purposes of the capacity analysis in accordance with FAA Advisory Circular No. 150/5300-14B, Design of Aircraft Deicing Facilities, which specifies the use of a 10-year planning period for proper pad sizing.
- The 2020 fleet mix was assumed to mirror the representative current fleet mix in terms of the percentage of each Airplane Design Group ("ADG") (i.e. Group III, Group IV, etc.). (The FAA categorizes aircraft into size classifications – ADGs – based on wingspan).
- CH2M HILL calculated an estimated peak hour departure rate for 2020, as described below, based on the FAA Terminal Area Forecast for Logan for 2020.

⁶ Daily all-cargo and GA aircraft departures were estimated based on actual Logan operations data provided to CH2M HILL by national aviation consulting firm Simat, Helliesen, and Eichner ("SH&E"). The January 2010 OAG provides the schedule of daily airline departures from Logan during the 2009/2010 winter season. See <http://www.oag.com/> (OAG web site). While CH2M HILL used Wednesday, January 20, 2010, as a representative date, the January 2010 OAG provides the same departure schedule for every weekday during that month.

- Aircraft deicing was assumed to be that required during light deicing conditions, that is, conditions under which deicing is required to remove slush, ice or frost from aircraft critical surfaces such as wings, control surfaces and engine inlets, but (1) that do not result in runway closures or significant cancellations, and (2) under which departure rates are maintained at near the level of peak departure rates in good weather. Such light deicing conditions represent the most conservative, and therefore the appropriate, scenario to use for purposes of properly sizing a centralized deicing pad for Logan.
- It was assumed that a centralized deicing pad would utilize truck-mounted deicing equipment (two trucks per aircraft for ADG II and III, and 2 to 4 trucks per aircraft for ADG IV and V, depending on the airline/deicing service provider) to apply deicing and anti-icing fluids. Total time through the pad (including maneuvering into and out of position, deicing and communications with the deicing crew and the air traffic control tower, was estimated by Massport Aviation Operations staff to be about 15-20 minutes during light deicing conditions.⁷

2. Determination of Peak Hour Departure Rate for Existing Operations

A review of Logan departure data from the OAG schedule for Wednesday, January 20, 2010, sorted by ADG and departures per hour, indicated that there are typically two departure peaks on any given weekday at Logan. (Air travel is greatest on weekdays because of business travel.) One departure peak occurs in the morning between the hours of 0600 and 0900, and the other departure peak occurs in the evening between the hours of 1700 and 1900.

The highest hourly departure rate for the period examined was 41 departures, which occurred twice, between 0800 and 0859 and between 1700 and 1759; therefore, a centralized deicing pad at Logan would need to accommodate a maximum of approximately 41 departures per hour to accommodate peak-hour departures during light deicing conditions.

3. Determination of Deicing Position Fleet Mix for Existing Operations

Using the same OAG departure data, CH2M HILL then calculated the number of each type of ADG deicing position that would be needed to accommodate peak hour departures, with larger aircraft groups requiring more area per position. The data indicate that of the peak hour departures (using the 0800-0859 hour), approximately 10 percent are Group I aircraft, 20 percent are Group II aircraft, 55 percent are Group III aircraft, 12 percent are Group IV aircraft, and 3 percent are Group V aircraft.

4. Determination of Number of Deicing Positions Required for Existing Operations

It was determined, using the number of each group of aircraft departing Logan during the current peak hour, and conservatively assuming that each aircraft would spend 20 minutes on the pad, that to enable Logan to maintain the current peak hour departure rate during light deicing conditions, a centralized deicing pad would

⁷ These estimated times were determined by Massport aviation operations staff after review of information provided by airlines at Logan and operators of deicing pads at other airports.

have to be sized for four (4) Group I/II, eight (8) Group III, two (2) Group IV and one (1) Group V aircraft, for a total of fifteen (15) deicing positions.

5. Determination of Peak Hour Departure Rate for Projected 2020 Operations

Based on the estimated number of peak hour departure deicing positions required for Logan's existing fleet mix and operations, centralized deicing pad sizing calculations were completed based on forecasted operations and fleet mix assumptions for the year 2020. The estimated number of peak hour departure deicing positions required for the existing fleet mix and operations was modified through the development of a growth ratio to scale 2009 numbers to predicted 2020 numbers.

Dividing the 404,789 departures per year that the FAA Terminal Area Forecast projects for 2020 by the 345,970 actual departures in 2009 results in a growth ratio of 1.17.

$$\frac{404,789 \text{ _departures / year}}{345,970 \text{ _departures / year}} = 1.17 \text{ _Growth _Factor}$$

This ratio of 1.17 was then applied to the 2010 peak hour departure rate determined above (that is, 41 aircraft per hour) to estimate the number of 2020 peak hour departures. Applying this growth ratio, 41 departures per hour times 1.17 equals 47.97 departures per hour, rounded to 48 departures per hour.

$$(41 \text{ _departures / hour}) \times (1.17 \text{ _growth _factor}) = 47.97 \rightarrow 48 \text{ _departures / hour}$$

6. Determination of Number of Deicing Positions Required for Projected 2020 Operations

The estimated 2020 peak hour departure rate of 48 aircraft per hour was then further broken down into ADG categories by applying the fleet mix percentages by ADG determined above (that is, 10 percent Group I aircraft, 20 percent Group II aircraft, 55 percent Group III aircraft, 12.5 percent Group IV aircraft, and 3 percent Group V aircraft). Conservatively assuming that each aircraft would spend 20 minutes on the pad, CH2M HILL calculated the number of deicing slots that would be necessary to accommodate 100 percent throughput of all projected departing aircraft of each size group.

For example:

$$\text{Group I/II} = 30\% * 48 \text{ departures} = 14.4 \text{ departures} \rightarrow 15 \text{ departures per peak hr}$$

$$\left(\frac{15 \text{ _departures}}{3 \text{ departures / HR / Slot}} \right) = 5.0 \Rightarrow 5 \text{ _Slots}$$

Based on the application of this formula, it was determined that to enable Logan to maintain the projected peak hour departure rate for 2020 during light deicing conditions, a centralized deicing pad would have to be sized for five (5) Group I/II,

nine (9) Group III, two (2) Group IV and one (1) Group V aircraft, for a total of seventeen (17) deicing positions. The results of calculations are summarized in Table 1 below.

Table 1 – Required Centralized Deicing Pad Deicing Slots (2020)

CDF Location	North & East Pads
Group I/II Spaces Required	5
Group III Spaces Required	9
Group IV Spaces Required	2
Group V Spaces Required	1
Total Number of Slots Required	17

B. Centralized Deicing Pad Layout

In determining the appropriate components and layout for a centralized deicing pad or pads at Logan that would comply with the Proposed Rule (including the proposed 100 percent throughput requirement), CH2M HILL assumed that such a pad or pads would be required to meet FAA requirements and guidance regarding airport and centralized deicing pad design and operation, including FAA Advisory Circular 150/5300-13, *Airport Design*, and FAA Advisory Circular 150/5300-14B, *Design of Aircraft Deicing Facilities*.

Therefore, it was assumed that each deicing position would be laid out in accordance with Table 3-1, Columns 1 and 2, of FAA Advisory Circular 150/5300-14B, *Design of Aircraft Deicing Facilities* for non-movement deicing pads, which provide for 12.5 foot wide Vehicle Maneuvering Areas and a 10 foot wide Vehicle Safety Zone for mobile deicing vehicles. In addition, it was assumed that in accordance with this FAA Advisory Circular, each pad would include: (1) bypass taxiing capability, (2) additional space for storage and staging of support equipment such as mobile deicing vehicles, water and deicing fluid storage tanks, a deicing ramp control building and airfield lighting such as flush-mounted in-pavement taxiway/taxilane edge lights and apron flood lighting (provided an air space analysis is performed to determine the allowable height of the high mast fixtures), (3) environmental runoff mitigation measures, (4) snow storage space with adequate room for portable ice melters, and (5) space for supplemental portable night time lighting, if needed. The aircraft capability to enter and depart the parking positions was validated using Transoft Solutions Aeroturn 2.0 to ensure that the aircraft could enter and exit the pad using conventional turning movements.

C. Centralized Deicing Pad Siting/Location

CH2M HILL made the following assumptions in siting a centralized deicing pad at Logan that would comply with the Proposed Rule:

- The location of the pad would comply with FAA requirements and guidance regarding airport and centralized deicing pad design and operation, including FAA Advisory Circular 150/5300-13, *Airport Design*, FAA Advisory Circular 150/5300-

14B, *Design of Aircraft Deicing Facilities, and Federal Aviation Regulations (FAR) Part 77, Objects Affecting Navigable Airspace.*

- Runway utilization during light deicing conditions would mirror Logan’s historic runway utilization during winter weather conditions. According to Massport aviation operations staff:
 - In a northeast wind, arrivals are on Runways 4L and 4R, and departures are from Runways 4L (except for jets), 4R and 9. This is the most common configuration during deicing conditions.
 - In a northwest wind, both arrivals and departures are on Runways 27 and 33L; if the wind is greater than 10 knots, Logan is allowed to use its new Runway 14/32 for smaller aircraft. This is the second most common configuration during deicing conditions.
 - In a southeast wind, arrivals are on Runway 15R and departures are from Runways 15R and 9. This is the third most common configuration during deicing conditions.
 - In a southwest wind, arrivals are on Runways 22L and 27, and departures are from Runways 22L and 22R. This configuration may be in use when morning deicing of frost is necessary.
 - In certain weather conditions, only one runway is used for both arrivals and departures. In heavy snow and/or low visibility, Runway 4R is normally the runway used; in strong winds, the runway facing most directly into the wind is used.

Aviation safety and operational considerations dictate that, to comply with the Proposed Rule’s requirement that all departing aircraft must be deiced at a centralized deicing pad, Logan would need to construct not just one pad, but three separate pads, with one pad located at the end of each of the three sets of departure runways used at varying times under deicing conditions. More particularly, to account for the fact that Logan uses different departure runways at different times depending on wind direction, compliance with the Proposed Rule would necessitate three separate centralized deicing pads: (1) one on the north side of the airport to serve Runways 22L, 22R, and 15R (the “North Pad”); (2) one on the east side of the airport to serve Runways 33L and 27 (the “East Pad”), and (3) one on the south side of the airport to serve Runways 4L, 4R, and 9 (the “Expanded Pad Juliet”).⁸ The conceptual locations for these three pads are shown in Figure 1.

1. North Pad

The North Pad would be laid out in accordance with FAA Advisory Circular 150/5300-14B, Design of Aircraft Deicing Facilities and would contain the required 17 deicing positions described above. It would also contain a 91,000 square foot support area to provide staging for the equipment, materials and support facilities described above, a 500,000 square foot snow storage area and a 2,805,000 square foot spent ADF collection area, for a total pad area of 3,365,000 square feet. Because the

⁸ According to Massport aviation operations staff, Runways 14, 15L, and 33R are minimally used during deicing conditions.

North Pad's purpose would be to deice all aircraft departing from Runways 22L, 22R, and 15R, and because of the lack of existing, open land area in the vicinity of the ends of those runways, it was determined that the only possible location for the North Pad would be on fill placed in the Boston Harbor tidelands near the approach end to Runway 22R, as shown in Figure 1. A theoretical layout for the North Pad is shown in Figure 2.

To accommodate the North Pad, approximately 3,609,660 square feet (83 acres) of Boston Harbor tidelands would need to be filled or altered. Massport staff indicated, based on their experience permitting other projects at Logan, it would be infeasible to obtain the environmental permits and approvals necessary to undertake such filling and alteration activity.

2. East Pad

The East Pad would also be laid out in accordance with FAA requirements for deicing facility design and would contain the required 17 deicing positions described above. It similarly would contain a 91,000 square foot support area, a 500,000 square foot snow storage area and a 2,805,000 square foot spent ADF collection area, for a total pad area of 3,357,000 square feet. Because the East Pad's purpose would be to deice all aircraft departing from Runways 33L and 27, and because of the lack of existing, open land area in the vicinity of the ends of those runways, it was determined that the only possible location for the East Pad would be on fill placed in the Boston Harbor tidelands near the approach end to Runway 33L, as shown in Figure 3. A theoretical layout for the East Pad is shown in Figure 3.

To accommodate the East Pad, approximately 3,330,570 square feet (77 acres) of Boston Harbor tidelands would need to be filled or altered. As with the North Pad, Massport staff indicated, based on their experience permitting other projects at Logan, it would be infeasible to obtain the environmental permits and approvals necessary to undertake such filling and alteration activity.

3. Expanded Juliet Pad

The Expanded Juliet Pad increases the size and utilization of an existing paved area in the Runway 14 overrun area that is bounded by Taxiway J to the north, Runway 14 to the south and Taxiway J1 to the east, and is currently used for limited off-gate deicing. To accommodate peak hour departures, the Expanded Juliet Pad requires 17 deicing positions, as described above, to comply with the Proposed Rule and accommodate all aircraft departing from Runways 4L, 4R, and 9. However, due to the anticipated difficulty in obtaining the required environmental permits and approvals, CH2M HILL evaluated the maximum possible theoretical build out of the Expanded Juliet Pad within Logan's existing geographic boundaries, so as not require any expansion into, placement of fill in or alteration of Boston Harbor tidelands.

As a result, the Expanded Juliet Pad would contain only nine deicing positions, rather than the 17 that would be required to accommodate either the existing or the projected 2020 peak departure rate. The number of positions required versus the number of positions provided at the Expanded Juliet Pad is summarized in Table 2.

Table 2 – Expanded Juliet Pad Capacity vs. Required Spaces

CDF Option	Expanded Pad Juliet
Group II Spaces Required	5
Group II Spaces Provided	0
Meets Requirements? Y/N	N
Group III Spaces Required	9
Group III Spaces Provided	7
Meets Requirements? Y/N	N*
Group IV Spaces Required	2
Group IV Spaces Provided	0
Meets Requirements? Y/N	N**
Group V Spaces Required	1
Group V Spaces Provided	2
Meets Requirements? Y/N	Y
Total Number of Slots Provided	9
Total Number of Slots Required	17
Deficiency (# of slots)	-8

- N** – Group I/II aircraft may be deiced on Group III or larger positions
N* - Group III aircraft may be deiced at Group IV or larger positions
N** - Group IV aircraft may be deiced at Group V positions

A conceptual layout for the Expanded Juliet Pad is shown in Figure 4. The Expanded Juliet Pad would be laid out in accordance with FAA requirements for deicing facility design. It would contain a 197,000 square foot snow storage area and a 1,107,000 square foot spent ADF collection area, for a total pad area of 1,175,000 square feet. In addition, the Expanded Juliet Pad would contain a 26,000 square foot mobile support area. Because of the space constraints at the Expanded Juliet Pad, and because the pad would be located in an area of the Logan airfield that, when not in use for deicing, comprises the Runway Safety Area for Runway 14-32 and critical FAA air space surfaces for Runways 14-32 and 9-27, all support facilities at the Expanded Juliet Pad would have to be portable so that no equipment would remain at the pad when deicing activities have been completed. Temporary support facilities would include a mobile control center, parking areas for deicing trucks, water trucks and mobile deicing fluid storage tankers, and portable lighting.

IV. OPERATIONAL CONSTRAINTS AND ISSUES

The use of certain land areas and airspace adjacent to and above runways and taxiways is restricted or prohibited in accordance with the FAA's "Object Clearing Criteria" (as set out in FAA Advisory Circular 150/5300-13, *Airport Design*). With respect to runways, these criteria proscribe the placement of certain "objects" (defined as including "above ground

structures, NAVAIDs, people, equipment, vehicles, natural growth, terrain, and parked aircraft”) in FAA-delineated areas, including:

- Runway Protection Zone (“RPZ”). The RPZ is a trapezoidal area that begins 200 feet beyond the end of the area usable for takeoff or landing. The FAA recommends clearing all permanent vertical structures and other objects from the RPZ, although it permits certain uses as long as they (1) do not attract wildlife, (2) are outside of the Runway Object Free Area (defined below) and (3) do not interfere with NAVAIDs. The dimensions of the RPZ depend on the approach category and airplane design group for the individual runway, and whether or not the runway is equipped with Instrument Landing System (“ILS”) capabilities.
- Runway Safety Area (“RSA”). The RSA is an unobstructed zone established around the perimeter of a runway to enhance safety in the event that an aircraft undershoots, overruns, or engages in an excursion from the side of the runway. Standard RSAs extend from 240 feet to 1,000 feet beyond each runway end and are between 120 feet and 500 feet wide, depending on the type of instrument approach procedures and size and type of aircraft served by the runway. Only permanent vertical structures and other objects that need to be located in the RSA because of their function may be located in the RSA, and even they cannot be more than three inches above grade in height unless they are designed to break off at the three-inch mark if impacted.
- Runway Object Free Area (“OFA”). The Runway OFA is also centered on the runway centerline but covers a rectangular area over and from the end of the runway that is between 250 and 800 feet wide and between 240 and 1,000 feet long. All permanent vertical structures and other objects protruding above the RSA edge elevation must be cleared from the Runway OFA, although the FAA allows objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes.

Based on these and similar FAA requirements, what follows is a summary of the operational constraints and unresolved aviation safety and operational issues associated with the North and East Pads and the Expanded Juliet Pad.

1. North Pad

Although the North Pad was positioned and laid out (for purposes of this initial feasibility analysis) to minimize potential FAA Object Clearing Criteria impacts, it would pose the following operational constraints or issues:

- Because the North Pad would be located within the Runway 15L RSA and RPZ, operation of the North Pad would require Runway 15L-33R to be closed for arrivals and departures.
- Because the North Pad would be located in the Runway 15L RSA and Runway OFA, all equipment used within the boundaries of the RSA and Runway OFA would have to be portable. Additionally, permanent objects located on the North Pad but within the boundaries of Runway 15L RSA and Runway OFA could protrude no higher than three inches above the ground surface unless fixed by

function, and would have to be mounted on frangible couplings that would shear at a height of three inches above the ground surface.

- Operation of the North Pad would require aircraft to taxi across Runway 15R-33L, which is used extensively during northwest and southeast wind conditions. This configuration would increase the risk of runway incursions and potentially cause delays for aircraft waiting to cross Runway 15R-33L to taxi to the North Pad.

2. East Pad

The East Pad was positioned and laid out (for purposes of this initial feasibility analysis) to minimize potential FAA Object Clearing Criteria impacts, but would nonetheless pose the following operational constraints or issues:

- Operation of the East Pad would require aircraft to taxi across parallel Runways 4L-22R and 4R-22L, which together comprise the runway configuration most used during low visibility operations. This deicing pad location would increase the risk of runway incursions and potentially cause delays for aircraft waiting to cross the two parallel runways to taxi to the East Pad.

3. Expanded Pad Juliet

The Expanded Juliet Pad was positioned and laid out in the only space within Logan's existing footprint available for the construction of a deicing pad. However, because of these space constraints, the Expanded Juliet Pad would be located at the approach end of Runway 14, in the Runway 14 RSA between the runway and Taxiway J, which would pose the following operational constraints or issues:

- Aircraft in deicing positions on the Expanded Juliet Pad would violate Runway 14-32 RSA and Runway OFA criteria, requiring the closure of Runway 14-32 to arrivals and departures.
- Only mobile/portable equipment could be used for deicing at the Expanded Juliet Pad. As noted above, the FAA requires RSAs to be kept free of all permanent objects except those objects that need to be located in the RSA based on their function. Deicing equipment is not classified as vital to runway function so cannot be located within the Runway 14-32 RSA. This would make the deicing process at the Expanded Juliet Pad less efficient compared to the conceptual North or East Pads or to existing permanently fixed centralized deicing pads such as those at Pittsburgh International, Denver International and Dulles International Airports (these airports, which are not subject to the same space constraints as Logan, were able to locate their centralized deicing pads sufficiently far away from their departure runways to allow permanent structures).
- Use of Expanded Juliet Pad would be limited to times when Runways 27 and 14-32 are not in use.
- Taxiway J and Runway 14 would have to operate as taxilanes during deicing operations.

- Due to space constraints, Taxiway J northwest of Deicing Position 8 would be restricted to Group III or smaller aircraft taxiing to Deicing Positions 1 through 7, and Deicing Position 1 through 7 would be limited to Group III or smaller aircraft.
- Due to space constraints, the vehicle service road between Runway 14-32 and the Boston Harbor (i.e., the perimeter road) would be temporarily closed to traffic when a Group IV aircraft taxied to Deicing Position 8.
- The Expanded Juliet Pad area would be designated as a non-movement area (i.e., not under direct Air Traffic Control Tower control) during deicing operations, which would allow for closer spacing of the aircraft deicing position centerlines in accordance with Table 3-1 of FAA Advisory Circular 150/5300-14B, Design of Aircraft Deicing Facilities.
- Permanent storage tanks for unmixed deicing fluid and water could not be located at the Expanded Juliet Pad because of the critical FAA surfaces (e.g., the RSA) that must be kept free and clear of equipment in order to operate Runway 14-32. Remote location of these tanks would increase deicing truck cycle time and slow down the deicing process because deicing trucks would have to leave the pad to refill.
- The Expanded Juliet Pad would require a snow storage area. However, the northwest end of the pad would be the only available area where Massport equipment could place snow removed from the rest of the pad. As a result, Deicing Position 1 would be lost to additional snow storage if the amount of snow accumulation on the pad required it.

V. COST ESTIMATES

What follows are the cost estimates CH2M HILL developed for the three deicing facilities.

A. North and East Pads

CH2MHILL's itemized cost estimates for the North and East Pads are included in Appendix A. These cost estimates were based on the following assumptions:

- The pavement sections used as the basis of the estimates assumed adequate subgrade conditions and were provided by Massport as follows:
 - Airfield Portland Cement Concrete (PCC) Pavement:
 - 15" PCC Pavement
 - 12" Crushed Aggregate Base Course
 - 12" Aggregate Subbase Course

- Airfield Bituminous Pavement
 - 10" Asphalt Concrete Pavement
 - 8" Asphalt Base Course
 - 21" Aggregate Subbase Course
- Mobilization/Demobilization would be five percent of the total of the other bid items.
- Maintenance and Protection of Air Traffic was assumed to be five percent of the other bid items.
- A 25 percent contingency of all other bid items (typical for an initial study) was included in the estimates for items not estimated.
- A 15 percent contingency of all other bid items was added for engineering design, construction management and program management fees for the project.
- Conceptual drainage was shown on the exhibits, requiring assumptions to be made regarding storm sewer and trench unit prices for the purposes of this estimate.
- Unsuitable excavation was assumed to be an additional 10 percent of the unclassified excavation item.
- The estimate does not include soft costs for planning, engineering and construction management services.
- The estimate does not include non-construction related items such as land purchase or environmental mitigations and clearances for construction in Boston Harbor.
- All prices in the estimate are assumed to be in 2010 dollars. No escalation has been included for construction projects beyond 2010.

The rough order of magnitude cost for physical construction is approximately \$779,000,000 for the North Pad and \$772,000,000 for the East Pad. Again, these estimates do not include costs for non-construction related items such as land purchase, environmental mitigation and clearances for construction in Boston Harbor.

B. Expanded Juliet Pad

The conceptual maximum build-out of the Expanded Juliet Pad is in an area currently paved with approximately six inches of bituminous pavement on top of crushed aggregate base course. This pavement design section may be adequate to support current aircraft operations in the existing Juliet Pad area, but it does not meet FAA pavement design criteria and would likely be inadequate to handle the anticipated traffic loads for the design life of the pavement. According to FAA Advisory Circular 150/5320-6E, "Airport Pavement Design and Evaluation," the current pavement section would have a useful life of less than five years for the anticipated Group III and smaller aircraft loads. To have a 20-year design life, the bituminous pavement thickness would have to be reconstructed to approximately 10 inches in depth, on top of a crushed aggregate base of at least 28 inches, assuming a California Bearing Ratio (a measure of pavement subgrade strength) of 6. The cost of

reconstructing this pavement is included in the Expanded Juliet Pad rough order of magnitude cost estimate (below) for planning purposes.

The existing drainage infrastructure at the existing Juliet Pad is located near the jet blast wall, far behind the aircraft parking positions, and collects excess surface runoff. The Expanded Juliet Pad would have to be retrofitted with trench drains to collect a higher concentration of deicing runoff. New trench drains are included in the Expanded Juliet Pad rough order of magnitude cost estimate for planning purposes.

CH2MHILL's itemized cost estimates for the Expanded Juliet Pad are also included in Appendix A. The cost estimates were based on the following assumptions:

- The pavement sections used as the basis of the estimates assumed adequate subgrade conditions and were provided by Massport as follows:
 - Airfield Portland Cement Concrete (PCC) Pavement:
 - 15" PCC Pavement
 - 12 "Crushed Aggregate Base Course
 - 12" Aggregate Subbase Course
 - Airfield Asphalt Cement Concrete (ACC) Pavement
 - 10" Asphalt Concrete Pavement
 - 8" Asphalt Base Course
 - 21" Aggregate Subbase Course
- Mobilization/Demobilization would be five percent of the total of the other bid items.
- Maintenance and Protection of Air Traffic was assumed to be five percent of the other bid items.
- A 25 percent contingency of all other bid items (typical for an initial study) was included in the estimates for items not estimated.
- A 15 percent contingency of all other bid items was added for engineering design, construction management and program management fees for the project.
- Conceptual drainage was shown on the exhibits, requiring assumptions to be made regarding storm sewer and trench unit prices for the purposes of this estimate.
- Unsuitable excavation was assumed to be an additional 10 percent of the unclassified excavation item.
- This estimate does not include soft costs for planning, engineering and construction management services.
- All prices in this estimate are assumed to be in 2010 dollars. No escalation has been included for construction projects beyond 2010.

The rough order of magnitude cost for the Expanded Juliet Pad is \$22,300,000.

VI. Conclusions

Logan would only be able to comply with both the Proposed Rule (including the 100 percent throughput requirement) and FAA requirements if it were to construct three centralized deicing pads, to the north, east and south of Logan's terminal areas. However, because of the space constraints imposed by Logan's geographic boundaries, the only possible locations for the North and East Pads would require the filling or alteration of approximately 160 acres of Boston Harbor tidelands. Massport staff indicates that, based on their experience permitting other projects at Logan, it would be infeasible to obtain the environmental permits and approvals necessary to undertake such filling and alteration activity. Moreover, even if such permits and approvals could be obtained, the cost of building the North and East Pads would be approximately \$1.56 billion.

The Expanded Juliet Pad would not enable Logan to meet the Proposed Rule's 100 percent throughput requirement. As shown in Table 2, although it would represent the maximum feasible fully FAA-compliant build out of the existing Juliet Pad within Logan's geographic footprint, the Expanded Juliet Pad would contain only nine deicing positions, not the 17 that would be required to accommodate 100 percent of departing aircraft at Logan's existing or projected 2020 peak departure rate. Moreover, the Expanded Juliet Pad presents a number of significant aviation safety and operational challenges.

VII. RELEVANT EXPERIENCE OF CH2MHILL

Most of the technical information contained in this document was provided by CH2M HILL, Inc. CH2M HILL provides comprehensive deicing management system design, implementation, operation, and associated regulatory compliance services as either a prime or sub-contractor to commercial airports and military airfields across the U.S. CH2M HILL's experience in airfield operations planning and sophisticated deicing and runoff control technology offers aviation facility operators the full spectrum of technological options, greater operational efficiency, and improved environmental compatibility.

CH2M HILL's Dr. Dean Mericas, PhD, is a nationally-recognized expert who has literally "written the book" on Deicing Planning Guidelines and Practices for Stormwater Management Systems through his work for the Transportation Research Board's Airport Cooperative Research Program. Dr. Mericas understands not only the technological options available, but also the complex interrelationships between airfield wintertime operations, deicing technologies and practices, the fate and transport of deicing pollutants across the airfield and in the environment, and the environmental regulations that drive the need for deicing controls. This technical leadership and integrated approach ensures successful solutions that reflect the state-of-the-science.

Maris Mangulis, P.E., has 19 years of experience in designing airfield improvement projects at major airports in the United States and abroad. Mr. Mangulis's experience includes numerous deicing studies and design of centralized deicing facilities, deicing collection systems, and storage tank designs.

Resumes for Dr. Mericas and Mr. Mangulis are included as attachments to this document.

RESUMES

Dean Mericas, PhD



Education:	PhD/Civil Engineering, ME/Environmental Engineering, BS/Biology
Professional Organizations	Airports Council International, 2006 – present Water Quality Working Group, 2006 - present American Association of Airport Executives, 1998 - present Environmental Services Committee, Water Quality Subcommittee, 2002 – present Airports Clean Water Alliance Associate, 2002 - present SAE International, 2009 - present Water Environment Federation, 1982 – 2007

Dr. Mericas is a principal technologist and senior project manager with the Global Transportation Group, located in CH2M HILL's Austin, TX office. He has more than 29 years of technical and supervisory experience, principally in assessment and management of nonpoint sources of pollution and their impacts on surface waters. Dr. Mericas directs development of innovative industrial stormwater management programs, regulatory compliance strategies and negotiations for municipal and industrial discharges, watershed characterization and management, water quality monitoring and assessment, and aquatic biological assessments.

Dr. Mericas is a leading expert in the control of the environmental impacts of airport deicing runoff and stormwater, and the negotiation of National Pollutant Discharge Elimination System (NPDES) permits for airports. He conceptualizes and applies computer modeling tools to analyze linkages between weather, deicing activities, deicing control options, and environmental impacts at airports across the U.S., and for the Air National Guard and U.S. Air Force. He developed NPDES permitting strategies and provided associated negotiation and compliance support to more than two dozen airports across the U.S.

Relevant Experience

Project Manager, NPDES Permit Compliance Services for the T.F. Green Airport, Rhode Island Airport Corporation, Providence, RI. This work was begun by Dr. Mericas during his previous employment, and continued when he joined CH2M HILL. Provided NPDES permit appeal and compliance support activities under a Task Order contract. Initial Task Orders included preparation of a Preliminary Deicing Control Alternatives Feasibility Assessment, updating the Airport's SWPPP to address new permit requirements, preparing a Deicing Management Program Plan, and providing on-call consultation to Airport staff on deicing-related issues. Subsequent Task Orders included continued service as a technical advisor to airport management and counsel, participation in ongoing permit appeal negotiations, and update and preparation of a final comprehensive feasibility assessment of alternatives for a long-term solution for controlling deicing runoff to meet complex and demanding regulatory agency requirements.

Technical Expert, Support in Contesting an NPDES Permit for the T.F. Green Airport, Tillinghast Liecht, Providence, RI. Contracted by the Rhode Island Airport Corporation's

outside counsel to serve as an expert on airport deicing impacts and controls in the support of a permit appeal. Worked with the Airport's counsel and senior management to develop and implement strategies that will result in technically sound and cost-effective protection of water quality.

Technical Expert, Preparation of Comments on the Proposed Deicing ELG for Boston Logan International Airport, Cambridge, MA. Serving as a key member of a team of technical and legal experts contracted by Massport counsel to prepare comments regarding the deficiencies in the EPA's proposed Effluent Limitation Guidelines and New Source Performance Standards for the Airport Deicing Category and the practicality of compliance by Boston Logan International Airport. The focus of this effort is on the feasibility of collection alternatives.

Project Manager, Deicing Pad Assessment for Logan International Airport, Massachusetts Port Authority, Boston, MA. Directed a high-level assessment of the feasibility of locating centralized deicing pads at Logan International Airport. The primary objectives were to determine basic feasibility, implications to operations, likely performance, and rough order of magnitude cost. Secondary objectives were to identify and describe likely performance of alternative collection strategies if it is concluded that deicing pads are infeasible, and assess options for disposal of deicing runoff collected using any of the potentially feasible strategies examined. The results of the study included identification and initial evaluation of five deicing facility alternatives.

Project Manager, Deicing Water Quality Study for Logan International Airport, Massachusetts Port Authority, Boston, MA. Directed all aspects of a comprehensive assessment of the potential physical, chemical, and ecological impacts of deicing discharges to the Boston Harbor and Massachusetts Bay environments. Study components included monitoring and modeling of deicer usage and resulting stormwater discharges, characterization of water quality and biotic responses to deicer loadings, and application of modeling tools to assess impacts under critical conditions in an ecological risk assessment framework.

Task Leader, NPDES Permit Renewal and Deicing System Evaluation Support to the Lambert - St. Louis International Airport, St. Louis Airport Authority, St. Louis, MO. Leading tasks involving deicing controls and related permitting and compliance under a multi-year on-call services contract. Tasks to date have included support in negotiation of renewal of the airport's industrial stormwater discharge permit and review and evaluation of the airport's existing deicing runoff control system.

Task Leader, NPDES and Industrial Discharge Permitting Support for the South Airfield Detention Basin at O'Hare International Airport, City of Chicago Department of Aviation, Chicago, IL. Assisting the Chicago Department of Aviation in obtaining NPDES and sanitary sewer discharge permits for the new South Airfield Detention Basin. The NPDES permit application is for a new outfall to the Des Plaines River. An anti-degradation demonstration is required because the River is on the State of Illinois' 303(d) list of impaired water bodies. The primary issue of concern with the sanitary discharge permit is ensuring that "clean" stormwater is not discharged to the Metropolitan Water Reclamation District system.

Project Manager, Deicing Best Management Practices Report for JFK International Airport, Port Authority of New York and New Jersey, New York, NY. Directed the identification and evaluation of Best Management Practices (BMPs) for controlling aircraft and airfield deicing runoff that are not currently being implemented at JFK International Airport, but could be in the future. The product of this effort was a Deicing BMP Report designed to satisfy compliance requirements in the Airport's NPDES Permit.

Technical Advisor/Task Manager, Technical Support to the Aviation Industry during U.S. EPA's Development of Effluent Limitation Guidelines for Deicing Discharges, ACI-NA, Washington, DC. Key member of a team of technical and legal experts contracted by Airport Council International-North America (ACI-NA) and Air Transport Association of America, Inc. (ATA). Providing expert technical advisory and analytical services in support of the aviation industry's interests with respect to the Airport Deicing Operations Effluent Limitation Guideline (ELG) currently being developed by the United States Environmental Protection Agency (EPA).

Subcontractor Project Manager, Stormwater and Deicing Management Program Support for the Gerald R. Ford International Airport, Grand Rapids, MI. Task leader for environmental compliance and water quality issues under a multi-year on-call services contract. Primary focus is the negotiation of an NPDES permit for airfield stormwater discharges, and operational issues and refinements for the airport's airport stormwater management program.

Task Leader, Drainage Design for a Deicing Pad at the Missoula International Airport, Missoula International Airport Authority, Missoula, MT. Providing technical direction for the design of the drainage controls for a new two-position deicing pad. Primary issues consist of utilizing available WWTP capacity for treatment of deicing runoff and sizing a tank for storage of concentrated deicing runoff prior to discharge to the sanitary sewer.

Principal Investigator, Implementation of Deicing Controls for Stewart Air National Guard Base, Stewart Air National Guard Base, Newburg, NY. Supported the Base's implementation of recommended deicing control improvements developed under a previous contract. Improvements consist of identification of designated deicing areas and installation of catch basin inserts to contain runoff at those locations, procurement of a mobile glycol collection vehicle, development of a strategy for management of deicer-laden snow, and preparation of standard operating procedures for the deicing runoff management system.

Principal Investigator, Estimate National Use of Aircraft and Airfield Deicing Materials, Airport Cooperative Research Program (ACRP), Washington, DC. Principal Investigator leading a multidisciplinary team of engineers, scientists, and legal experts assessing the magnitude and distribution of aircraft and airfield deicer usage in the U.S., and characterizing the existing environmental regulatory requirements that pertain to the control of deicing runoff.

Principal Investigator, Managing Runoff From Aircraft and Airfield Deicing and Anti-Icing Operations, ACRP, Washington, DC. Directed and led a multidisciplinary team of engineers, scientists, and legal experts in preparing Deicing Planning Guidelines and Practices for Stormwater Management Systems, the first ever standard reference for developing deicing runoff control programs under an FAA-funded project with the Transportation Research Boards' Airport Cooperative Research Program. The effort included a comprehensive compilation and

review of all available literature and other information, preparation of an annotated bibliography, a survey of aircraft and pavement deicing runoff control practices across the U.S., Canada, and Europe, characterization of practical BMPs in terms of applicability, performance, and cost. Activities included outreach and technology transfer via live presentations and an industry webinar.

Project Manager, Alternative Aircraft and Airfield Deicing and Anti-Icing Formulations With Reduced Aquatic Toxicity and Biological Oxygen Demand, ACRP, Washington, DC.

Project Manager on a multidisciplinary team of engineers and scientists tasked with developing alternative components and formulations for aircraft and pavement deicers. Project Manager role consists of supporting the Principal and Co-Principal Investigators in coordinating the complex technical team and meeting project milestones. Technical role involves bringing an understanding of airfield operations to the evaluation of prospective alternative deicer formulations, and assessing the environmental impact of those formulations in the context of commercial airfields.

Principal Investigator, Investigation of Elevated BOD and Recommendation of Corrective Actions for Stewart Air National Guard Base, Stewart Air National Guard Base, Newburg, NY.

Conducted an investigation into elevated BOD concentrations in the Base's stormwater discharges. The cause was found to be related to deicing activities at the Base. The effort included review of historical deicing activity records and water quality monitoring data, review of the Base's NYSPDES Permit, field monitoring during a deicing event during the 2006-2007 deicing season, and support in negotiation of revised permit limits and monitoring locations as part of the renewal of the NYSPDES Permit. Permit negotiations resulted in relocation of the point of compliance and a 2.5 – 5.5 times increase in seasonal BOD discharge limits. Recommended actions included improvements to the methods for deicing runoff containment and collection, and management of deicer-laden snow.

Task Leader, PDX Deicing Enhancement Analysis & Preferred Option Study, Port of Portland, Portland, OR. Key member of technical team that assessed alternatives for enhancing an existing deicing control system to achieve consistent compliance with the airport's NPDES Permit, and associated TMDL. The product of the team's efforts was a recommended conceptual system design that utilizes existing infrastructure and systems to the greatest extent possible, while also meeting all environmental compliance goals. Investigated the current state-of-the-science in deicing source reduction technologies, evaluated their applicability at PDX, and recommended technologies with potential for yielding significant reductions in deicer usage. Directed the development and application of modeling tools for predicting and evaluating the long-term performance of alternative scenarios. Served as technical advisor on deicing control and regulatory issues.

Subcontractor Project Manager, Aircraft Deicing Fluid Treatment Feasibility Study for the Detroit Metropolitan Wayne County Airport, Wayne County Airport Authority, Detroit, MI. Part of a multi-disciplinary team contracted to investigate and evaluate alternatives to treating aircraft deicing runoff. The alternatives consisted of 1) discharge to the City of Detroit's WWTP, 2) an on-site anaerobic treatment facility, 3) an on-site membrane bioreactor, and 4) an on-site reverse osmosis treatment. Assignment on the team focused on investigating the experience of other airports in implementing comparable treatment alternatives.

Technical Expert, Deicing Program Assistance to the Buffalo Niagara International Airport, Buffalo-Niagara Frontier Transportation Authority, Buffalo, NY. Brought in as a technical expert to review the Buffalo-Niagara International Airport's NPDES permit and deicing control program. Reviewed facility plans, operations, and monitoring data. Presented findings and recommendations to Airport management, and assisted in the development of an RFP for an on-site deicing runoff collection and disposal contractor.

Project Manager, Support in the Renewal of an NPDES Permit for Discharges of Deicing Runoff at the Detroit Metropolitan Wayne County Airport, Wayne County Airports Authority, Detroit, MI. Assisted the airport in developing and pursuing a successful strategy for renewing their permit for wintertime deicing discharges with significant increases in numerical limits. Activities involved direct collaboration with Airport environmental and legal staff.

Project Manager, Aircraft Deicing Facilities Plan Implementation for the General Mitchell International Airport, General Mitchell International Airport, Milwaukee, WI. Managed and directed the design and implementation of a progressive program of deicing collection, treatment, and recycling to meet NPDES permit requirements for 42.5% collection. Designed and implemented pilot studies, and oversaw the implementation of a full-scale program. Assisted in negotiations for discharges of deicing runoff to a WWTP, and directed the preparation of a Deicing Facility Plan as an addendum to the existing Stormwater Pollution Prevention Plan. Worked with outside counsel to negotiate a permit renewal strategy that provides "credits" in the form of reduced collection requirements in return for demonstrated glycol conservation efforts. The airport's deicing management program received the Governor's Award for Excellence in Hazardous Waste Reduction in 2000.

Task Leader, NPDES Permit Renewal Support to the Kansas City International Airport, Kansas City International Airport, Kansas City, MO. Providing technical and regulatory support to the Airport in renewal of its NPDES industrial stormwater permit. The focus is on identifying deficiencies in effluent limitations and other permit requirements, developing appropriate alternative approaches, and supporting the implementation of those approaches in the form of changes negotiated through the permit renewal process.

Task Leader, Austin-Bergstrom International Airport Glycol Treatability Study, Austin-Bergstrom International Airport, Austin, TX. Key member of technical team developing recommendations for improving the management and discharge of deicing runoff discharges to the South Austin Regional Wastewater Treatment Plant. Evaluated the operation of the airport's deicing runoff controls, and compared performance against industry norms. Provided information on deicing discharge practices at other airports, and evaluated applicability at ABIA.

Program Manager, Comprehensive Environmental Compliance Services at Baltimore/Washington and Martin State Airports, Maryland Aviation Administration, MD. Directed all activities on a multi-year, on-call environmental compliance support contract. Task orders included: assisting in the renewal of BWI's NPDES permit that included Maryland Department of the Environment agreeing to a maximum 30% discharge of all glycol applied on an annual basis in lieu of numerical water quality discharge limits, development of industrial and municipal stormwater management program elements, development of public education materials, and deicing program development and operation.

Subcontractor Project Manager, Design of a Central Deicing Pad for the Detroit Metropolitan Wayne County Airport, Wayne County Airports Authority, Detroit, MI. Key member of an engineering team contracted to design and oversee the construction of a new central deicing facility. Focus was on bringing an understanding of deicing runoff transport pathways to the design team in the first phase of design development, refinement of glycol collection strategies, and integration with the Airport's overall NPDES compliance strategy. The facility was designed and constructed over a very tight 6-month period, and consistently provides very high performance in collecting large volumes of recyclable concentrations of deicing runoff.

Subcontractor Project Manager, Glycol Recovery System Study for Tweed-New Haven Regional Airport, Tweed-New Haven Regional Airport, New Haven, CT. Key member of a multi-disciplinary team of engineers that evaluated the needs for controlling deicing runoff, assisted in the negotiation of an NPDES permit from the Connecticut Department of Environmental Protection based on actual environmental impacts and reasonable controls, and designed a program that is consistent with the permit requirements.

Subcontractor Project Manager, Watershed and Deicing Management Services for the Ted Stevens Anchorage International Airport, Ted Stevens Anchorage International Airport, Anchorage, AK. Led water quality tasks as part of a CH2M HILL led team of engineers and collection/treatment experts contracted to develop and implement a comprehensive watershed management program. Responsible for directing and supporting activities associated with water quality analyses and modeling, deicing impacts evaluations, pilot evaluations of deicing control and treatment/recycling alternatives, and regulatory compliance. Analyzed the assimilative capacity of two 303(d) listed lakes that receive Airport drainage, conducted conceptual and field pilot evaluations of deicing control alternatives, assisted in negotiation of an industrial pretreatment permit for discharges to the local WWTP, participated in the Airport's stakeholder involvement process, authored sections of a Water Body Recovery Plan, co-authored a Water Body Recovery Plan for the lakes, and assisted in development and implementation of negotiation strategy for a new NPDES permit. Particularly challenging aspects of the project included addressing regulatory requirements for two 303(d) listed lakes that receive most of the deicing runoff, and developing an understanding of complex food web interactions in the lakes that have resulted in the recent development of flourishing, and problematic macrophyte communities.

Publications:

Books/Reports

Mericas, D., T. Ajello, J. Lengel, and J. Longsworth. "Deicing Planning Guidelines and Practices for Stormwater Management Systems." Airport Cooperative Research Program Report 14. May 2009.

Ferguson, L., S. Corsi, S. Geis, Mericas, D., K. Jobak, and H. Gold. "Aircraft Deicing and Airfield Anti-Icing Formulations: Aquatic Toxicity and Biochemical Oxygen Demand." Airport Cooperative Research Program Web-only Document 3. November 2008.

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Mericas, D. 2005a. "Principles for Airport Drainage Design for Managing Deicing Runoff." *The Military Engineer*. March-April.

Mericas, D. 2005b. "Advances in Airport Stormwater Management." *Water Environment & Technology*. January.

Mericas, D. and C. Cieciek. 2001. "State-of-the-Art Automatic Flow Monitoring and Sampling/Sensing Technology." *Stormwater*. 2(7):12-21 November/December.

Switzenbaum, M.S., S. Veltman, D. Mericas, B. Wagoner, and T. Schoenberg. 2001. "Best Management Practices for Airport Deicing Stormwater." *Chemosphere*. 43 1051-1062.

Wagoner, B. and D. Mericas. 2000. "Deicing Runoff Control at DTW: A Success Story." *Ground Handling International*. July/August.

Mericas, D. and B. Wagoner. 2000. "The Challenge of Winter Weather." *Ground Handling International*. January/February.

Mericas, D. 1996. "Runway Deicers: A Varied Menu." *Airport Magazine*. July/August.

Mericas, D. and B. Wagoner. 1994. "Balancing Safety and the Environment: Managing Aircraft Deicing Fluid's Impact on Airport Stormwater." *Water Environmental & Technology*. December.

Conference Presentations and Proceedings(Selected)

Mericas, D., 2009. EPA's Proposed Effluent Guidelines for Airport Deicing: Some Industry Observations and Concerns. FAA Great Lakes Regional Conference. Schaumburg, IL. November.

Mericas, D., 2009. Airport Cooperative Research Program Report 14: Managing Runoff From Aircraft and Airfield Deicing and Anti-Icing Operations. AAAE/ACI-NA Aircraft and Airfield Deicing and Stormwater Issues Webinar. September.

Mericas, D. 2009. Airport Cooperative Research Program Project 02-01 Alternative Aircraft and Airfield Deicing and Anti-Icing Formulations with Reduced Aquatic Toxicity and Biological Oxygen Demand. ACI-NA/ATA/RAA Airline and Airport Deicing Management Conference. Cincinnati, OH. July.

Mericas, D. and R. Loveridge, 2009. Application of Ecological Risk Assessment Tools to Evaluate Potential Stormwater Discharge Toxicity. ACI-NA 2009 Environmental Affairs Conference. Seattle, WA. April.

Mericas, D. 2008. Deicing Regulations and Deicing BMPs: Recent Developments in Deicing Runoff Management. FAA New England Region 2008 Airports Conference. Bedford, MA. October.

Mericas, D., and J. Longworth. 2008. Existing Clean Water Act Requirements and Relationship to ELG. Airline and Airport Deicing Management Conference. Washington, DC. July.

Mericas, D., T. Bongiorno Ajello, and LTC M. Johnson. 2008. NPDES Permit Modification as a Compliance Strategy. National Defense Industrial Association 2008 JSEM Training Conference & Exposition - Environment and Energy Management in a Transforming DoD. Denver, CO. May.

Mericas, D. 2007. Implications of Climate Change to Airport Stormwater Management. 16th Annual Aircraft and Airfield Deicing and Stormwater Conference, Baltimore, MD. August.

Mericas, D. 2006. Session Moderator, Source Control Opportunities Session. 15th Annual Aircraft and Airfield Deicing and Stormwater Conference, Alexandria, VA. August.

Mericas, D. 2005. Introduction to Computer Models and Using Computer Models to Evaluate Environmental Benefits of New Aircraft Deicing Fluid. Presented at the 14th Annual Aircraft, Airfield Deicing and Stormwater Conference & Exposition, Washington, DC. August.

Mericas, D. 2005. Principles for Airport Drainage Design for Deicing Runoff Management. Presented at 14th Annual Airport Environmental Management Conference. Denver, CO. April.

Mericas, D. 2004. Airport Stormwater Management – Contemporary Issues. Presented at 52nd Annual Fall Conference, Michigan Association of Airport Executives, Kalamazoo, MI. September.

Mericas, D., T. Ecklund, and J. Longworth. 2004. An Adaptive Management Approach to Developing Airport Deicing Control Programs. Presented at the 13th Annual Aircraft, Airfield Deicing and Stormwater Conference & Exposition, Washington, DC. August.

Mericas, D. 2004. Total Maximum Daily Loads: A (Brief) Consumer's Guide. Presented at AAAE Water/Air Permitting Workshop. Indianapolis, IN. May.

Mericas, D. 2004. Emerging Water Quality Issues for Airport NPDES Permits. Presented at National Aviation Environmental Management Conference, National Permitting and Trends Panel. Indianapolis, IN. May.

Cieciek, C. and D. Mericas. 2002. Characterizing the Performance of Airport BMPs in Controlling Deicing Materials in Stormwater. Presented at StormCon 2002, Marcos Island, FL. August.

Maris Mangulis, PE



Education:	BS/Civil Engineering
Licenses and Certifications	Professional Engineer/PA, IL, FL

Mr. Mangulis has 22 years of diversified experience in civil engineering. He has significant technical and administrative expertise in the area of airport management. His past responsibilities included project management and technical support for a multi-year general services contract at Pittsburgh International and Allegheny County Airports, as well as NAVAID design coordination at O'Hare International Airport. His design experience includes grading and drainage, pavement design, deicing collection system design, and utility design.

Mr. Mangulis' work for airport projects has involved pavement inspection and design, planning, resident inspection, deicing studies and environmental/regulatory considerations. He also has site development design experience for residential and military family housing.

Relevant Experience

Project Manager; Deicing Pad C Boom Relocation, Pittsburgh International Airport; USAirways, Inc.; Pittsburgh, PA. Responsible for the design of construction plans and specifications to relocate two aircraft deicing booms, install four spent deicing fluid storage tanks, new pumps at Deicing Pad E, and deicing collection improvements at Deicing Pad N-South. The projects were completed on time for the start of the 2000-2001 deicing season.

Task Manager; Aircraft Deicing Study, Pulliam Municipal Airport; City of Flagstaff; Flagstaff, AZ. Prepared a 30% design report that investigated deicing practices at Pulliam Airport, and identified alternatives with costs for implementation. The study investigated at-gate and remote deicing pad options for air carrier and general aviation aircraft, and recommended possible locations along with approximate construction costs.

Project Manager/Project Engineer; General Services, Pittsburgh International Airport; Allegheny County Airport Authority; Pittsburgh, Pennsylvania. Responsible for a general services contract for the Allegheny County Airport Authority (ACAA). This project involves providing on-call services for all phases of the airport operations, including planning, civil, electrical, mechanical, structural, environmental, and geotechnical engineering; architectural evaluations and administrative assistance. Services are provided through the ACAA for the Pittsburgh International Airport and the Allegheny County Airport.

Deicing and environmental tasks performed:

- **Miscellaneous Environmental.** Provide on-call consultation for various environmental issues including deicing fluid runoff mitigation; contaminated soil remediation; stream and air sampling; and coordination with environmental regulating agencies. Prepared specific action plans and progress reports in compliance with an Administrative Order issued to the ACAA by the Pennsylvania Department of Environmental Protection.

Project Manager; Deicing Tank Replacement, Pittsburgh International Airport; Ascent Technologies Pittsburgh, PA. Supervised the preparation of an airspace study for four new neat glycol storage tanks at Deicing Pads Echo and Charlie. Supervised the submission of FAA Form 7460 for approval.

Project Manager; Deicing Pad E Boom Relocation, Pittsburgh International Airport; USAirways; Pittsburgh, PA. Responsible for the design of construction plans and specifications to relocate two (2) aircraft deicing booms. Managed and coordinated the preparation of pavement removal/replacement drawings, pavement marking plans, airfield electrical plans and specifications. The boom relocation was necessary to meet the clients requirements for a revised aircraft fleet mix before the 1999-2000 deicing season. The project was designed on a fast track schedule between June and September 1999 and was completed on time and within budget.

Project Manager; Deicing Pad C Drainage Improvements, Pittsburgh International Airport; Allegheny County Department of Aviation; Pittsburgh, PA. Managed the design of a concrete diversion vault and pump system to intercept deicing fluid runoff at an existing storm sewer, and divert to a collection tank. The project was mandated by the Pennsylvania Department of Environmental Protection as a result of an Administrative Order issued to the ACDA, that included a full set of plans and specifications, and an amendment to an existing Engineer's Report. Provided assistance to the ACDA in obtaining FAA approval to fund the project under an existing FAA grant, that had available excess funding. This approval resulted in the FAA paying for 75% of the design, construction, and construction management fees for the project, resulting in a considerable cost savings to the ACDA.

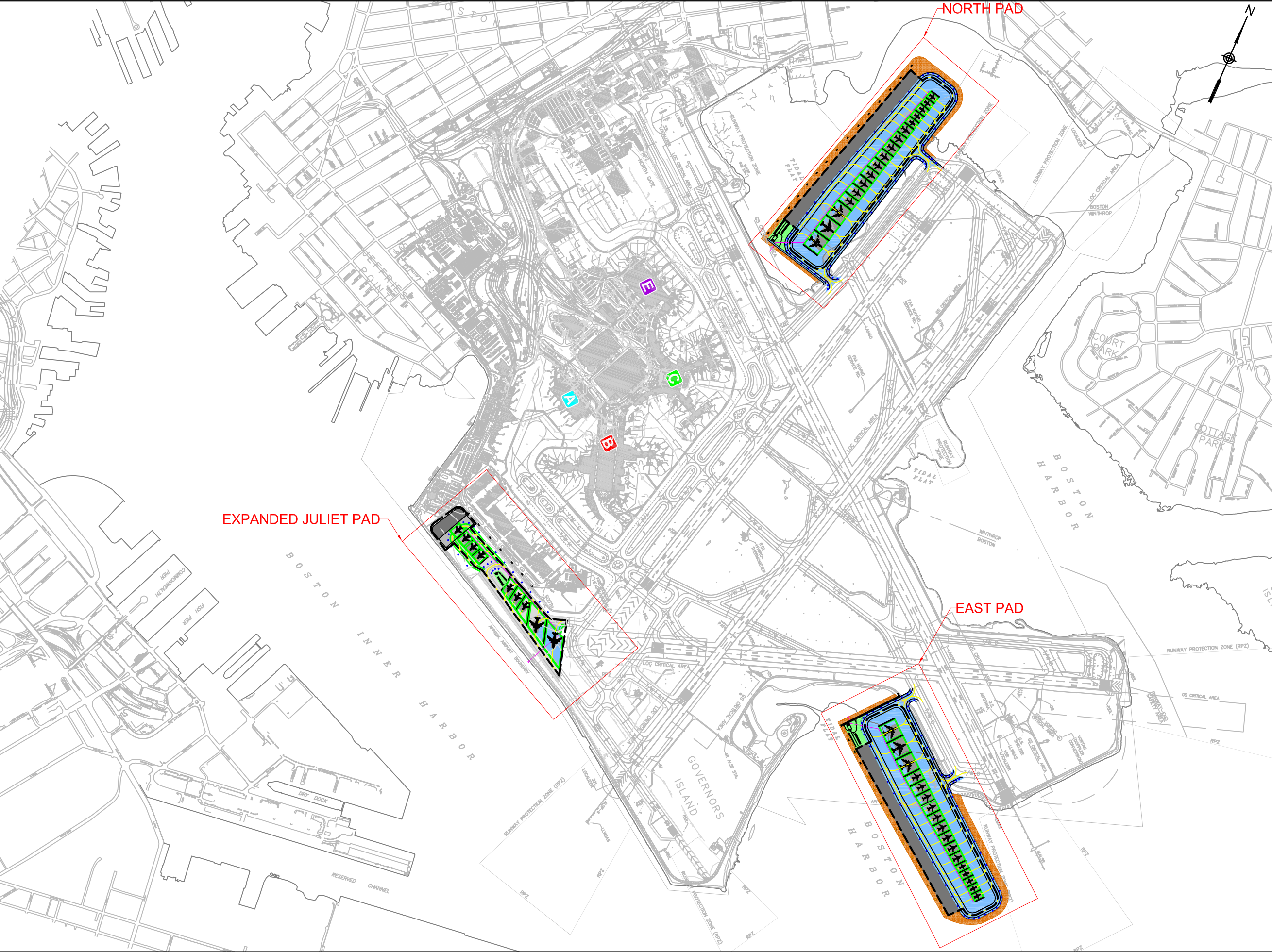
Project Engineer; Aircraft Deicing Facilities Study, Washington Dulles International Airport; Metropolitan Washington Airports Authority; Chantilly, VA. Responsible for the preparation and completion of a deicing study which addresses existing deicing usage quantities and procedures, climatological data, and drainage patterns as well as proposed methods for the collection, containment and disposal of spent deicing fluid. The report offers an alternatives analysis, findings and recommendations and a suggested action plan for the future handling of spent deicing fluids.

Project Engineer; Aircraft Deicing Facilities Study, Harrisburg International Airport; Pennsylvania Department of Transportation; Harrisburg, PA. Responsible for the preparation of the study identified regulatory requirements, collection and containment needs and disposal options for several deicing facility alternatives. Prepared a National Pollutant Discharge Elimination System (NPDES) Notice of Intent (NOI) application to discharge stormwater associated with industrial activities.

Project Engineer; Deicing Facilities Study; Confidential Client; Memphis, TN. Responsible for the preparation of a deicing facilities study for a cargo carrier hub. The study addressed airfield and aircraft deicing runoff collection, containment and disposal. Alternatives were evaluated for gate and off-gate deicing facilities and for airfield deicing procedures which had the least impact on the time dependent departure schedules of the aircraft.

Design Manager, Apron and Taxiway Reconstruction, Phases 1 and 2; Maine Air National Guard; Bangor International Airport; Bangor, ME. Managed the design of the Type B services for Phases 1 and 2 of the aircraft parking aprons and taxiway improvements for the 101st Air Refueling Wing, Maine Air National Guard at Bangor International Airport. Supervised a diverse staff of eight engineers and 3 CAD operators to produce two bid packages that allowed the MeANG to bid the project based on available funding. The design included a design analysis report, construction drawings, specifications using SPECINTACT, and a cost estimate at every submittal. The design also included airspace analysis for the project's impact on the airport's Taxiway A and Runway 15-33. The design components included removal and replacement of the aircraft parking apron that supports KC-135s, including POL and drainage systems. The PCC apron was replaced with a bituminous concrete apron and PCC hardstand at the parking/fueling positions. The work included extensive coordination with the design of the POL hydrant fueling pits, isolation pit vault, and low point drain pit.

FIGURES



LOGAN
INTERNATIONAL
AIRPORT



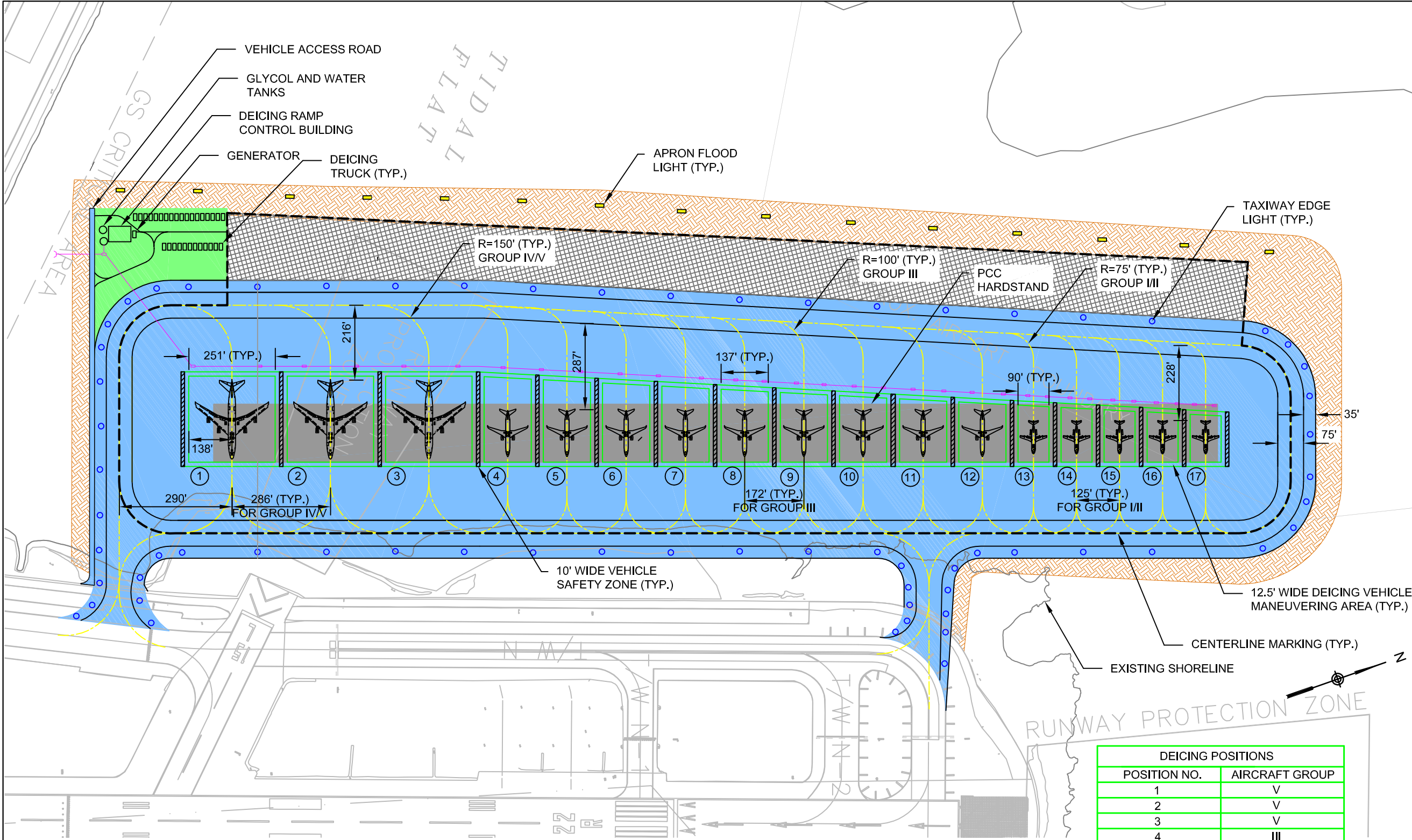
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ECONOMIC PLANNING AND
DEVELOPMENT DEPARTMENT
MASSACHUSETTS
PORT AUTHORITY
NOVEMBER 2008

CH2MHILL

LEGEND:

NOT TO SCALE

FIGURE 1
CENTRALIZED DEICING PAD
LOCATION PLAN



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ECONOMIC PLANNING AND
DEVELOPMENT DEPARTMENT
MASSACHUSETTS
PORT AUTHORITY
NOVEMBER 2008

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LEGEND:

- SUPPORT AREA
- APRON FLOOD LIGHTS
- FLUSH-MOUNTED TAXIWAY EDGE LIGHT
- NEW HOT MIX ASPHALT (HMA)
- EXISTING PAVEMENT
- NEW PORTLAND CEMENT CONCRETE (PCC)
- NEW CONCEPTUAL DRAINAGE
- AIRCRAFT DEICING POSITION
- SELECT EARTH FILL
- SNOW STORAGE AREA
- DEICING FLUID COLLECTION AREA

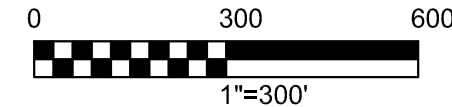


FIGURE 2
UPDATED CDF STUDY-
2020 NORTH PAD

NOTES:

1. GROUP V TAXILANE OBJECT FREE AREA = 276'.

2. LAYOUT PROVIDES FOR 3 GROUP IV/V, 9 GROUP III AND 5 GROUP I/II PADS.

3. DEICING PAD RADII MEET FAA AIRCRAFT DESIGN GROUP STANDARDS.

4. DRAINAGE IMPROVEMENTS ARE SHOWN CONCEPTUALLY.

5. SUPPORT AREA INCLUDES STAGING AREA FOR EQUIPMENT, MATERIALS, AND SUPPORT FACILITIES

6. PAD DESIGNED FOR FULL USE AROUND THE PERIMETER FOR GROUP V AIRCRAFT.
7. PAD REQUIRES LAND PURCHASE, DEWATERING, PILE FOUNDATIONS AND EMBANKMENT CREATION IN THE TIDAL FLAT.

8. AIRCRAFT GROUP SHOWN IS MAXIMUM AIRCRAFT SIZE PERMITTED ON THE PAD. PAD MAY BE USED FOR MAXIMUM GROUP SIZE OR SMALLER.
- SUMMARY OF AREAS**

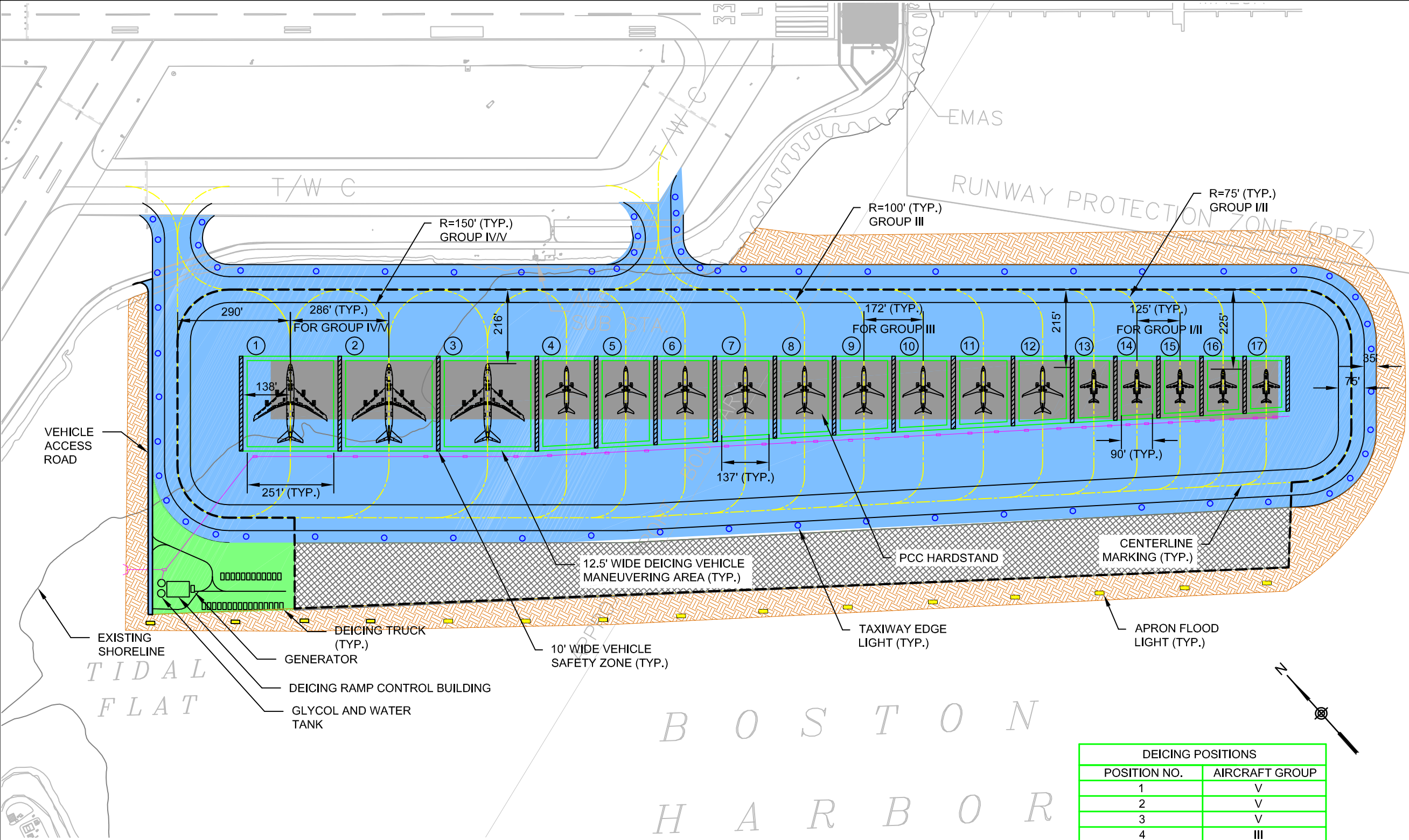
NEW HMA AND PCC PAVEMENT = 2,774,000 SQUARE FEET

DEICING FLUID COLLECTION AREA = 2,805,000 SQUARE FEET

SUPPORT AREA = 91,000 SQUARE FEET

SNOW STORAGE AREA = 500,000 SQUARE FEET

DEICING POSITIONS	
POSITION NO.	AIRCRAFT GROUP
1	V
2	V
3	V
4	III
5	III
6	III
7	III
8	III
9	III
10	III
11	III
12	III
13	II
14	II
15	II
16	II
17	II



LOGAN
INTERNATIONAL
AIRPORT



AIRPORT PLANNING UNIT
ECONOMIC PLANNING AND
DEVELOPMENT DEPARTMENT
MASSACHUSETTS
PORT AUTHORITY
NOVEMBER 2008

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LEGEND:

- SUPPORT AREA
- APRON FLOOD LIGHTS
- FLUSH-MOUNTED TAXIWAY
EDGE LIGHT
- NEW HOT MIX ASPHALT (HMA)
- EXISTING PAVEMENT
- NEW PORTLAND CEMENT
CONCRETE (PCC)
- NEW CONCEPTUAL DRAINAGE
- AIRFIELD DEICING POSITION
- SELECT EARTH FILL
- SNOW STORAGE AREA
- DEICING FLUID COLLECTION
AREA

NOTES:

- GROUP V TAXILANE OBJECT FREE AREA = 276'.
- LAYOUT PROVIDES FOR 3 GROUP IV/V, 9 GROUP III, AND 5 GROUP I/II PADS.
- DEICING PAD RADII MEET FAA AIRCRAFT DESIGN GROUP STANDARDS.
- DRAINAGE IMPROVEMENTS ARE SHOWN CONCEPTUALLY.
- SUPPORT AREA INCLUDES STAGING AREA FOR EQUIPMENT, MATERIALS, AND SUPPORT FACILITIES.
- PAD DESIGNED FOR FULL USE AROUND THE PERIMETER FOR GROUP V AIRCRAFT.

- PAD REQUIRES LAND PURCHASE, DEWATERING, PILE FOUNDATIONS AND EMBANKMENT CREATION IN THE TIDAL FLAT.
- AIRCRAFT GROUP SHOWN IS MAXIMUM AIRCRAFT SIZE PERMITTED ON THE PAD. PAD MAY BE USED FOR MAXIMUM GROUP OR SMALLER.

SUMMARY OF AREAS

NEW HMA AND PCC PAVEMENT = 2,766,000 SQUARE FEET
DEICING FLUID COLLECTION AREA = 2,805,000 SQUARE FEET
SUPPORT AREA = 91,000 SQUARE FEET
SNOW STORAGE AREA = 500,000 SQUARE FEET

DEICING POSITIONS	
POSITION NO.	AIRCRAFT GROUP
1	V
2	V
3	V
4	III
5	III
6	III
7	III
8	III
9	III
10	III
11	III
12	III
13	II
14	II
15	II
16	II
17	II

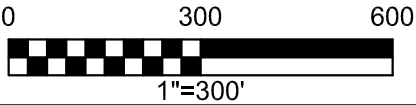


FIGURE 3
UPDATED CDF STUDY -
2020 EAST PAD

COST ESTIMATES

Logan International Airport
North Pad

SUMMARY OF QUANTITIES					
Item No.	Description	Quantity	Unit	Unit Cost	Total Cost
1	Mobilization / Demobilization	1	LS	\$ 25,786,888	\$ 25,786,888
2	Geotextile	496,000	SY	\$ 3	\$ 1,488,000
3	Selected Earth Fill	294,000	CY	\$ 50	\$ 14,700,000
4	Subgrade / Embankment Preparation	441,000	SY	\$ 10	\$ 4,410,000
5	CSV Columns	441,000	SY	\$ 500	\$ 220,500,000
6	Hot Mix Aggregate Pavement, P-401, 10" Depth	168,000	TON	\$ 130	\$ 21,840,000
7	Asphalt Base Course 8" Depth	134,000	TON	\$ 65	\$ 8,710,000
8	Aggregate Subbase, P-154, 21" Depth	170,000	CY	\$ 35	\$ 5,950,000
9	PCC Pavement, P-501, 15" Depth	54,700	SY	\$ 175	\$ 9,572,500
10	Crushed Aggregate Base Course, P-209, 12" Depth	18,300	CY	\$ 50	\$ 915,000
11	Aggregate Subbase Course, P-154, 12" Depth	18,300	CY	\$ 35	\$ 640,500
12	Pavement Markings, P-620	23,500	SF	\$ 2	\$ 49,350
13	Stormwater Pollution Prevention/ Erosion and Sediment Control	1	LS	\$ 50,000	\$ 50,000
14	Permanent Seeding and Mulching	14	AC	\$ 1,100	\$ 15,400
15	Aircraft Rated Inlet	35	EA	\$ 10,000	\$ 350,000
16	Storm Drain 24 inch	900	LF	\$ 140	\$ 126,000
17	Storm Drain 36 inch	900	LF	\$ 190	\$ 171,000
18	Storm Drain 48 inch	900	LF	\$ 360	\$ 324,000
19	Storm Drain 60 inch	900	LF	\$ 450	\$ 405,000
20	Force Main	200	LF	\$ 500	\$ 100,000
21	Sod	67,800	SY	\$ 10	\$ 678,000
22	Supporting Utilities	1	LS	\$ 1,000,000	\$ 1,000,000
23	Apron Flood Light	15	EA	\$ 80,000	\$ 1,200,000
24	Medium Intensity Taxiway Edge Lights	65	EA	\$ 1,800	\$ 117,000
25	Miscellaneous Electrical	1	LS	\$ 300,000	\$ 300,000
26	Support Area Structures (Ice House, Generator, Tanks....etc)	1	LS	\$ 250,000	\$ 250,000
27	Coffer Dam	5,546,900	SF	\$ 40	\$ 221,876,000

TOTAL	\$	541,524,638
25% Contingency	\$	135,381,159
15% Engineering and CM	\$	101,535,870
TOTAL	\$	778,441,666
Say		\$779 Million

Notes:

- 1 Assumes full 39" excavation for new pavement and replacing pavement
- 2 White/yellow = 1' wide, black = (2 x 6") 1' wide, all yellow and white paint bordered with 6" black paint on PCC, Red Paint for Vehicle Safety Zones
- 3 This estimate excludes permitting costs

Calculated: NM

Checked: MB

Logan International Airport
East Pad

SUMMARY OF QUANTITIES					
Item No.	Description	Quantity	Unit	Unit Cost	Total Cost
1	Mobilization / Demobilization	1	LS	\$ 25,553,758	\$ 25,553,758
2	Geotextile	434,000	SY	\$ 3	\$ 1,302,000
3	Selected Earth Fill	290,000	CY	\$ 50	\$ 14,500,000
4	Subgrade / Embankment Preparation	433,000	SY	\$ 10	\$ 4,330,000
5	CSV Columns	433,000	SY	\$ 500	\$ 216,500,000
6	Hot Mix Aggregate Pavement, P-401, 10" Depth	167,000	TON	\$ 130	\$ 21,710,000
7	Asphalt Base Course 8" Depth	134,000	TON	\$ 65	\$ 8,710,000
8	Aggregate Subbase, P-154, 21" Depth	169,000	CY	\$ 35	\$ 5,915,000
9	PCC Pavement, P-501, 15" Depth	54,800	SY	\$ 175	\$ 9,590,000
10	Crushed Aggregate Base Course, P-209, 12" Depth	18,300	CY	\$ 50	\$ 915,000
11	Aggregate Subbase Course, P-154, 12" Depth	18,300	CY	\$ 35	\$ 640,500
12	Pavement Markings, P-620	23,500	SF	\$ 2	\$ 49,350
13	Stormwater Pollution Prevention/ Erosion and Sediment Control	1	LS	\$ 50,000	\$ 50,000
14	Permanent Seeding and Mulching	13	AC	\$ 1,100	\$ 14,300
15	Aircraft Rated Inlet	35	EA	\$ 10,000	\$ 350,000
16	Storm Drain 24 inch	900	LF	\$ 140	\$ 126,000
17	Storm Drain 36 inch	900	LF	\$ 190	\$ 171,000
18	Storm Drain 48 inch	900	LF	\$ 360	\$ 324,000
19	Storm Drain 60 inch	900	LF	\$ 450	\$ 405,000
20	Force Main	200	LF	\$ 500	\$ 100,000
21	Sod	63,000	SY	\$ 10	\$ 630,000
22	Supporting Utilities	1	LS	\$ 1,000,000	\$ 1,000,000
23	Apron Flood Light	15	EA	\$ 80,000	\$ 1,200,000
24	Medium Intensity Taxiway Edge Lights	65	EA	\$ 1,800	\$ 117,000
25	Miscellaneous Electrical	1	LS	\$ 300,000	\$ 300,000
26	Support Area Structures (Ice House, Generator, Tanks...etc)	1	LS	\$ 250,000	\$ 250,000
27	Coffer Dam	5,546,900	SF	\$ 40	\$ 221,876,000

TOTAL	\$	536,628,908
25% Contingency	\$	134,157,227
15% Engineering and CM	\$	100,617,920
TOTAL	\$	771,404,055
Say		\$772 Million

Notes:

- 1 Assumes full 39" excavation for new pavement and replacing pavement
- 2 White/yellow = 1' wide, black = (2 x 6") 1' wide, all yellow and white paint bordered with 6" black paint on PCC, Red Paint for Vehicle Safety Zones
- 3 This estimate excludes permitting costs

Calculated: NM

Checked: MB

Logan International Airport
Expanded Juliet Pad

SUMMARY OF QUANTITIES					
Item No.	Description	Quantity	Unit	Unit Cost	Total Cost
1	Mobilization / Demobilization	1	LS	\$ 736,914	\$ 736,914
2	Existing Pavement Removal	41,300	SY	\$ 20	\$ 826,000
3	Subgrade / Embankment Preparation	38,600	SY	\$ 10	\$ 386,000
4	Unsuitable Excavation	3,600	CY	\$ 35	\$ 126,000
5	Unclassified Excavation, P-152	36,000	CY	\$ 60	\$ 2,160,000
6	Hot Mix Aggregate Pavement, P-401, 10" Depth	27,000	TON	\$ 130	\$ 3,510,000
7	Asphalt Base Course 8" Depth	22,000	TON	\$ 65	\$ 1,430,000
8	Aggregate Subbase, P-154, 21" Depth	28,000	CY	\$ 35	\$ 980,000
9	PCC Pavement, P-501, 15" Depth	15,300	SY	\$ 175	\$ 2,677,500
10	Crushed Aggregate Base Course, P-209, 12" Depth	5,100	CY	\$ 50	\$ 255,000
11	Aggregate Subbase Course, P-154, 12" Depth	5,100	CY	\$ 35	\$ 178,500
12	Pavement Markings, P-620	11,700	SF	\$ 2	\$ 24,570
13	Stormwater Pollution Prevention/ Erosion and Sediment Control	1	LS	\$ 50,000	\$ 50,000
14	Aircraft Rated Inlet	19	EA	\$ 10,000	\$ 190,000
15	Storm Drain, 24"	800	LF	\$ 140	\$ 112,000
16	Storm Drain, 36"	800	LF	\$ 190	\$ 152,000
17	Storm Drain, 48"	800	LF	\$ 360	\$ 288,000
18	Storm Drain, 60"	800	LF	\$ 450	\$ 360,000
19	Force Main	200	LF	\$ 500	\$ 100,000
20	Apron Flood Light	7	EA	\$ 80,000	\$ 560,000
21	Medium Intensity Taxiway Edge Lights	26	EA	\$ 1,800	\$ 46,800
22	Miscellaneous Electrical	1	LS	\$ 300,000	\$ 300,000
23	Permanent Seeding and Mulching	2	AC	\$ 1,100	\$ 2,200
24	Sod	670	SY	\$ 10	\$ 6,700
25	Adjust Manhole to Grade	4	EA	\$ 4,000	\$ 16,000
26	Relocate Windsock	1	EA	\$ 1,000	\$ 1,000

TOTAL	\$	15,475,184
25% Contingency	\$	3,868,796
15% Engineering and CM	\$	2,901,597
TOTAL	\$	22,245,576
Say		\$22.3 Million

Notes:

- 1 Assumes full 39" excavation for new pavement and replacing pavement with off-site disposal
- 2 White/yellow = 1' wide, black = (2 x 6") 1' wide, all yellow and white paint bordered with 6" black paint on PCC, Red Paint for Vehicle Safety Zones

Calculated: NM
Checked: MB

Deicing Runoff Storage Analysis

Boston Logan Airport

Massachusetts Port Authority

February 2010

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Executive Summary

Deicer Runoff Storage Modeling

The Massachusetts Port Authority (Massport) is faced with proposed new environmental regulations relating to deicing at Boston Logan International Airport (Logan). CDM has been tasked by Massport to help evaluate the proposed regulatory requirements included in US EPA's proposed rule "Effluent Limitation Guidelines (ELG) and New Source Performance Standards for the Airport Deicing Category," which was issued August 29, 2009 in the Federal Register. The proposed rule would require top tier airports such as Logan to implement best available technology to collect and treat deicing runoff.

This report expands upon previous water quality studies to evaluate the implications of the proposed deicing ELG. The primary objective of this analysis was to estimate the total volume of storage capacity that would be needed at Logan to comply with EPA's proposed deicing ELG by collecting deicing runoff. Because deicing runoff is not currently collected at Logan, there are no existing storage facilities. To develop this estimate, CDM:

- Used numerical modeling to simulate Type I Aircraft Deicing Fluid (ADF) and Type IV Aircraft Anti-icing Fluid (AAF) usage at Logan over the range of weather conditions seen over the last 61 years, assuming current operations and plane departure schedules;
- Used numerical modeling to quantify stormwater volume and Biological Oxygen Demand (BOD) mass that would accumulate during each of the modeled deicing seasons in hypothetical end-of-pipe storage tanks;
- Identified a single design deicing season, representing a maximum storage needs scenario, for use in subsequent evaluations; and
- Quantified the required storage volumes, load capture, and flow capture that would be necessary to meet the requirements of the proposed ELG, based on the single design season modeling.

CDM's modeling identified the winter of 1993-1994 as the deicing season whose weather would result in the greatest runoff storage needs at Logan under current conditions. Therefore, the weather data from the 1993-1994 deicing season was used to model in more detail the runoff flow and BOD loading to simulated storage facilities, with flow and load disposal allowances, under two operational scenarios:

- Current deicing practices with collection near the outfalls
- Deicing all aircraft at a hypothetical centralized deicing facility with a dedicated collection system

This centralized deicing facility (CDF) was evaluated as the Expanded Juliet Pad, which is described in a companion report by CH2M Hill titled “Pad Juliet Centralized Deicing Facility Location Maximum Build-out Assessment,” dated January 27, 2010.

Conclusions

Collecting all deicing runoff under current practices of deicing at the gates with outfall collection would require 94.2 million gallons (MG) of storage capacity.

Collecting all deicing runoff from the hypothetical Expanded Juliet Pad would require 4.3 MG of storage capacity. If this runoff were stored in the type of large (1.8 MG) storage tanks used at Logan’s fuel farm, deicing runoff collection would require the construction of 3 new large storage tanks for the expanded Juliet Pad, or 52 new large tanks for the gate deicing/outfall collection scenario to meet the proposed ELG rule.

Section 1

Deicer Runoff Storage Modeling

1.1 Background

The Massachusetts Port Authority (Massport) is faced with proposed new environmental regulations relating to deicing at Boston Logan International Airport (Logan). CDM has been tasked by Massport to help evaluate the proposed regulatory requirements included in US EPA's proposed rule "Effluent Limitation Guidelines (ELG) and New Source Performance Standards for the Airport Deicing Category," which was issued August 29, 2009 in the Federal Register. The proposed rule would require top tier airports such as Logan to implement best available technology to collect and treat deicing runoff. This report expands upon previous water quality studies to evaluate the implications of the proposed deicing ELG.

The primary objective of this analysis is to estimate the total volume of storage capacity that would be needed at Logan to comply with EPA's proposed deicing ELG by collecting deicing runoff. Because runoff is not currently collected at Logan, there are no existing runoff storage facilities. To develop this estimate, CDM is conducting the following process:

- Use numerical modeling to simulate Type I Aircraft Deicing Fluid (ADF) and Type IV Aircraft Anti-icing Fluid (AAF) usage at Logan over the range of weather conditions seen over the last 61 years, assuming current operations and plane departure schedules;
- Use numerical modeling to quantify stormwater volume and Biological Oxygen Demand (BOD) mass that would accumulate during each of the modeled deicing seasons in hypothetical end-of-pipe storage tanks;
- Identify a single design deicing season, representing a maximum storage needs scenario, for use in subsequent evaluations; and
- Quantify the required storage volumes, load capture, and flow capture that would be necessary to meet the requirements of the proposed ELG, based on the design season modeling.

1.2 Extended Simulations to Identify Winter Design Season

This technical report builds on previous modeling work prepared for the 2009 report "Water Quality Impacts of Deicing at Boston Logan International Airport" by explicitly simulating stormwater flows, loads and storage requirements for application areas and drainage areas.

The estimated stormwater storage capacity needs are driven by the combination of four factors:

- Magnitudes of deicing and defrosting events (which drive the accumulation of BOD mass and concentration in storage that constrain permitted outflows)
- Magnitudes of precipitation and snowmelt events over a collection area (which contribute the volumetric stormwater inflows)
- Timing of such events in combination and in sequence (which dictates the “initial conditions” at the start of each event)
- Hydraulic and load discharge allowances to treatment facilities

To identify an appropriate volume for onsite storage of runoff, CDM applied a continuous simulation of climate and hydrology over an extended period, rather than a focus on individual storm events. This continuous simulation accounts for actual conditions such as back-to-back storm events and inflows and discharges from simulated storage facilities. The purpose of this modeling is to identify a single appropriate design season for further detailed investigation of design parameters.

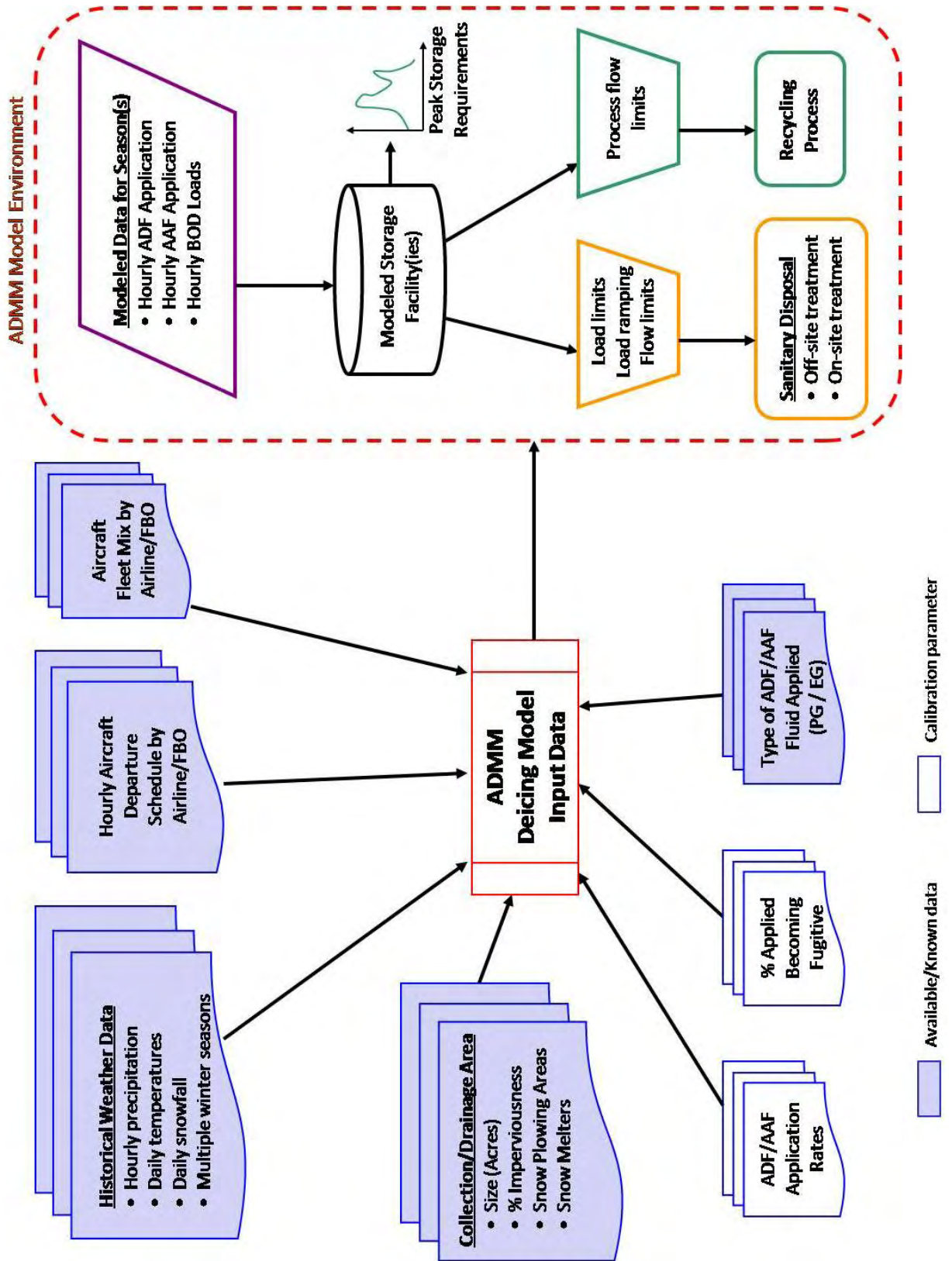
To conduct this extended period analysis, the model was simulated for 61 seasons of available weather data: October 1948 – April 2009. Hourly precipitation, daily snowfall, and daily temperature data for this period were obtained from the Logan Airport national weather station 72509, KBOS.

1.3 Model Overview and Construction

The analyses presented here were conducted using CDM’s proprietary Airport Deicing Management Model (ADMM), which has been used at numerous airports across the country and results accepted by regulatory agencies. The ADMM was created to support the design, sizing, and permitting of airport deicing facilities, including infrastructure for mitigation, collection, and storage of spent deicing fluids. The model calculates storm runoff and quality, ADF+AAF mass loadings, discharges to onsite or offsite treatment facilities, and capture and containment system storage volumes and concentrations as a function of weather conditions, flight schedules, and system operations and infrastructure. The model’s hydraulic calculations are based on standard urban watershed runoff methods and simple flow and mass balances.

Figure 1-1 provides a summary of the inputs and data sources to the ADMM model. Although there are numerous inputs and parameters for establishing a model, most are available from known data sources. Other key parameters such as per-plane application rates have been carried forth from the previous Water Quality Study. Any other necessary assumptions or modifications to the model configuration or calibration were reasonable and based on professional judgment and experience.

Figure 1-1
ADMM Schematic and Inputs



A model was previously constructed for Logan Airport using site-specific infrastructure, snowmelters, operations, and local weather data. ADF+AAF per-plane application rates were previously calibrated in this model based on monthly and daily deicer usage data provided by the carriers for the past two deicing seasons (2007-08 and 2008-09) and primarily by targeting three winter storm events in 2008-09.

The previously developed model was revised to include conceptualized storage tanks at the two major stormwater outfalls that receive deicer-laden stormwater: North Outfall and West Outfall. Additionally, Massachusetts Water Resource Authority's (MWRA) Deer Island wastewater treatment facility was added to provide realistic constraints on offsite discharge of collected stormwater to treatment. A screenshot of the model interface, including conceptual model schematic, are shown in **Figure 1-2**. As with the previous model, each major carrier at the airport was modeled as a separate deicing "catchment", each with their own unique departure schedules, calibrated "per-plane" ADF+AAF application rates, and specific ADF+AAF products. Also, as in the previous model, stormwater drainage areas were represented with stormwater outfall objects (North and West outfalls only).

The storage capacities of the two simulated storage tanks were configured in the ADMM as infinite in size to prevent overflows in the model environment. Similarly, no hydraulic constraints were considered for the stormwater drainage network ("Linkages") from the individual deicing catchments. After consultation with MWRA, the maximum feasible discharge from Logan to the Deer Island facility was estimated to be 33,000 lbs/day BOD (5% of the facility's solids capacity) and 32.5 MGD (10% of the facility's hydraulic capacity)¹. The model ensures that each of these constraints is met during each simulation day.

Carrier-specific plane departure schedules and fleet mix were established during the Logan Water Quality Study and represent an average departure schedule based on the average of three winter snow events from the 2008-2009 season that exhibited cancellations (**Table 1-1**)². Carrier-specific use of ADF+AAF products was established based on reported data from the airlines and fixed-base operators. The model utilized BOD concentrations of 1,080,000 and 490,000 mg/L in pure propylene glycol (PG) and ethylene glycol (EG), respectively per literature values.

¹ It is important to note that these numbers are based only on the capacity of the Deer Island Treatment Plant. MWRA has not agreed that it could or would accept this discharge, nor has it estimated the potential costs.

² Actual departure data from 12/19/08, 1/18/09, and 3/2/09 storm events.

Figure 1-2
Logan ADMM Model Interface and System Schematic

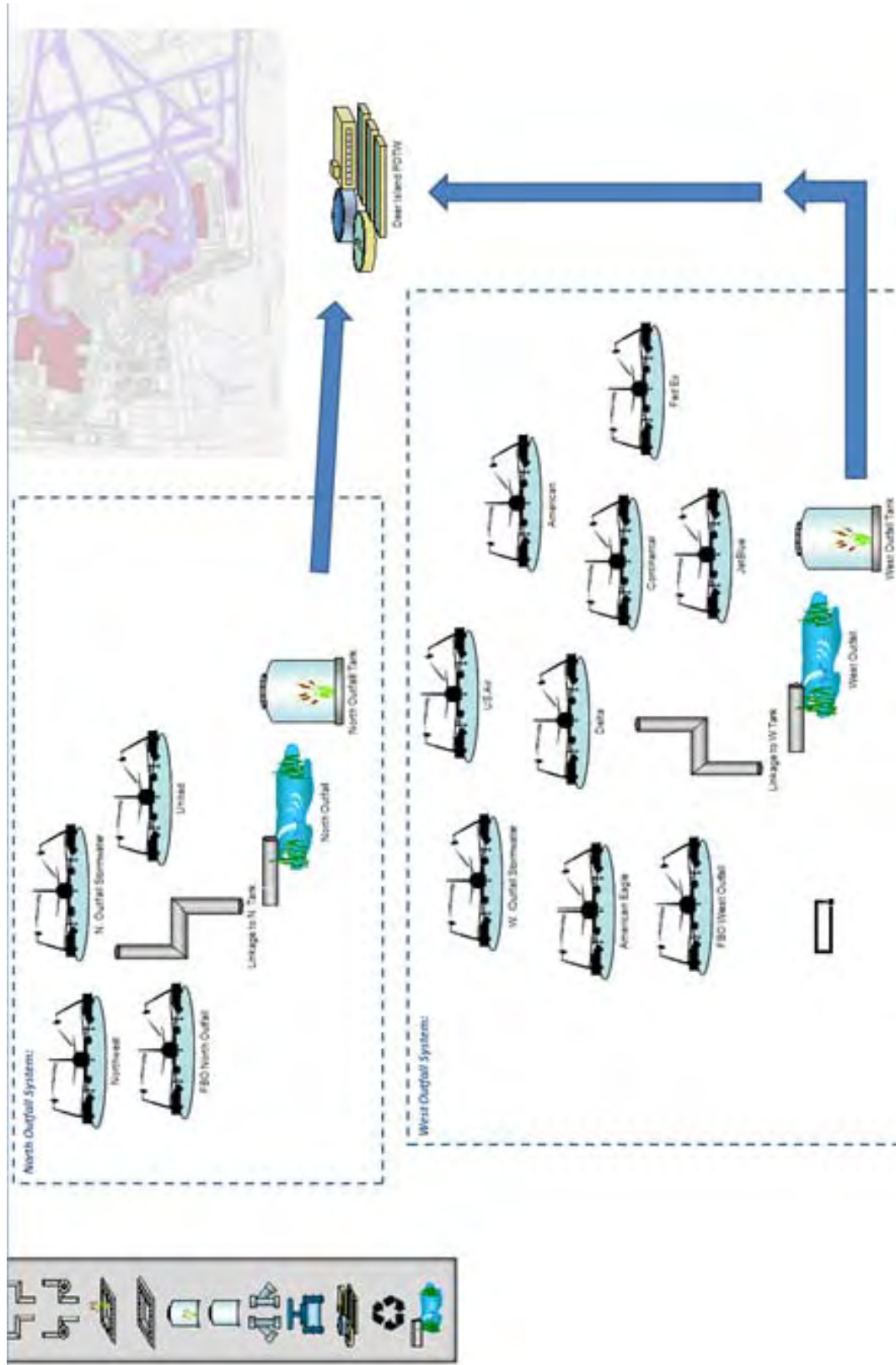


Table 1-1: Airport-wide Departure Schedule and Fleet Mix

Hour Starting	Aircraft Design Group					Average Departures
	Group I	Group II	Group III	Group IV	Unknown	
0:00	0	0	1	0	0	1
1:00	0	0	0	0	0	0
2:00	0	0	0	0	0	0
3:00	0	0	0	0	0	0
4:00	0	0	0	0	0	0
5:00	0	0	3	0	0	3
6:00	0	1	9	1	2	13
7:00	0	3	12	3	3	21
8:00	0	3	6	4	1	14
9:00	0	6	14	5	4	29
10:00	0	5	11	2	3	22
11:00	0	4	7	1	2	14
12:00	0	3	4	1	2	11
13:00	0	3	9	0	2	15
14:00	0	3	8	2	3	16
15:00	1	7	7	1	4	21
16:00	0	4	10	1	3	18
17:00	1	4	8	1	3	17
18:00	0	2	12	2	8	24
19:00	0	5	14	3	5	28
20:00	0	5	10	1	4	20
21:00	0	4	7	1	2	15
22:00	0	1	4	1	2	8
23:00	0	1	2	1	2	6
TOTALS	4	66	158	33	55	316

Actual departures and fleet mix by airline quantified as average actual operations during three winter storm events: 12/19/08, 1/18/09, and 3/2/09.

The end-of-pipe capture percentage of spent ADF+AAF was set at 50% in the model, based on the results of the sampling and empirical site-specific observations presented in the Water Quality Study. In other words, the model assumes that 50% of the applied ADF+AAF mass and volume makes its way along with 100% of stormwater runoff to the stormwater outfalls and subsequent conceptualized storage facilities. The residual 50% is assumed to be lost from the system through fugitive loss mechanisms such as evaporation, biological degradation, or physical tracking off-site.

The model assumes that only glycol-containing stormwater is collected, which would be accomplished in practice by installing a valve system that would allow stormwater to be diverted to storage over the duration of a deicing event. In non-deicing conditions, stormwater would be allowed to discharge from the outfall as it does under current conditions. Collection of all glycol-containing stormwater based on

empirical observations was assumed in order to meet the requirements of the proposed ELG. For top tier airports such as Logan, the proposed deicing ELG requires these airports to employ best available technology to collect 60% of “normalized ADF,” which EPA defines as ADF less any water added by the manufacturer or customer before ADF application.³ EPA assumes that 80% of applied ADF and 10% of applied AAF is available for collection.⁴ Thus, 48% (60% of 80%) of applied ADF and 6% (60% of 10%) of applied AAF must be collected.

Lastly, as with previous modeling, the model’s “full flush” option was used for simulating the surface build-up and subsequent release of ADF+AAF from the stormwater drainage area. This option accumulates captured ADF+AAF mass and volume on the land surface, and within snowpack, until such time that a flushing mechanism occurs. This flushing mechanism can be either rainfall or snowmelt and causes the full release of accumulated ADF+AAF from the land surface or in subsurface pavement and into the draining runoff. This model feature provides a more realistic representation of ADF+AAF overland routing dynamics at Logan.

1.4 Identification of Design Winter Season

Simulation results indicate storage requirements of approximately 51 MG and 47 MG for the West and North outfalls, respectively, to capture 100% of the stormwater flow and available load during deicing events over the full simulation period of 61 deicing seasons (**Figure 1-3**). The worst-case seasons for storage requirements are the 1967–68 deicing season and the 1993-94 deicing season, for the West and North outfalls, respectively. The median seasons, with respect to annual maximum storage, are 1964-65 (21 MG) for the West outfall and 1948-49 (12 MG) for the North outfall. Results are summarized in **Table 1-2** below.

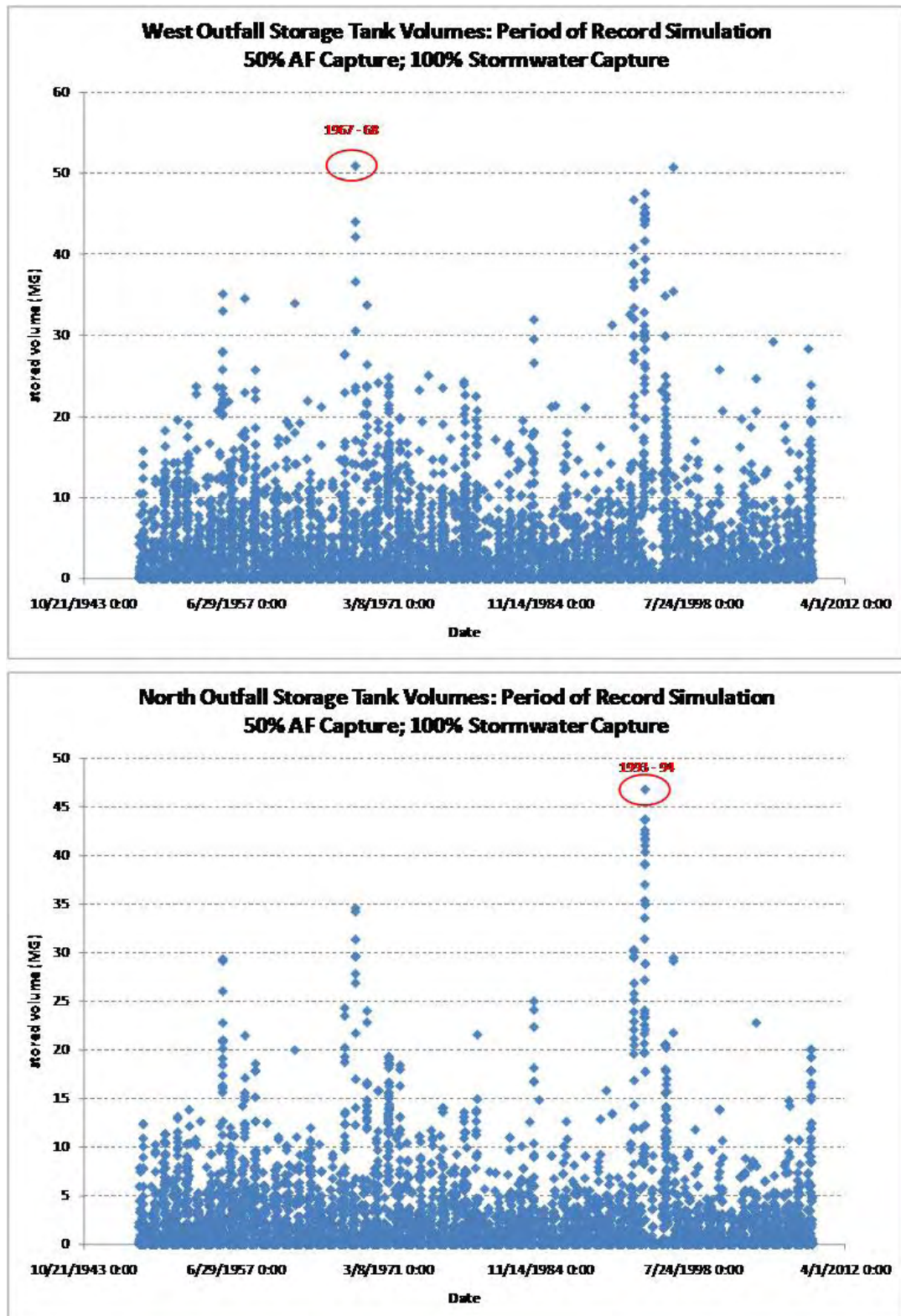
Table 1-2: Seasonal Storage Requirements for 100% Flow and Load Capture

Modeled Scenario	West Outfall Drainage Area	North Outfall Drainage Area
Worst-case Storage Requirements	51 MG (1967-68 season)	47 MG (1993-94 season)
Median Storage Requirements	21 MG (1964-65 season)	12 MG (1948-49 season)
Design Storage Requirements	48 MG (1993-94 season)	47 MG (1993-94 season)

³ Federal Register Vol. 74, No. 166 “Effluent Limitation Guidelines and New Source Performance Standards for the Airport Deicing Category; Proposed Rule,” dated August 28, 2009.

⁴ US EPA’s “Technical Development Document for Proposed Effluent Limitations Guidelines and Standards for the Airport Deicing Category,” dated July 2009.

Figure 1-3
ADMM Storage Requirements for Outfall Drainage Area Collection



The 1993-94 deicing season was selected for use in subsequent storage design modeling at a more refined timestep. This winter season was identified as the critical year with greatest overall storage requirements for Logan, including the greatest simulated storage requirements for the North Outfall, and 4th greatest storage requirements for the West Outfall.

Daily stormwater outfall BOD load simulations are provided in **Figure 1-4**. A recurrence analysis is provided in **Figure 1-5** to illustrate the frequency of individual day outfall loading magnitudes, mainly the distribution of larger events. While the majority of simulation days over the period of record exhibit essentially zero BOD loading (background runoff concentrations), large spikes are seen on days of flushing following ADF+AAF application. This phenomenon is observed as “first flush” where runoff will entrain previously applied ADF+AAF that resides on top of the pavement or within the pavement section.

Annual simulated ADF+AAF usage totals from the period of record are summarized in **Figure 1-6**. Total modeled seasonal volumes of applied ADF+AAF range from approximately 0.6 MG (1994-95) to approximately 2.0 MG (1955-56), with a median seasonal usage of 1.3 MG (1967-68). These volumes are reported as “as-applied” volumes using the dilution rates currently used by airlines operating at Logan. Pure glycol volumes would be approximately half of the reported “as-applied” volumes of ADF and AAF. Results are summarized in **Table 1-3** below.

Table 1-3: Simulated Usage of ADF and AAF over Historical Period of Record

Modeled Winter Season	Type I ADF Applied (gal)	Type IV AAF Applied (gal)
Maximum Season	1,800,000 gal (1955-56 season)	200,000 gal (1955-56 season)
Median Season	1,200,000 gal (1967-68 season)	100,000 gal (1967-68 season)
Minimum Season	600,000 gal (1994-95 season)	10,000 gal (1994-95 season)

Figure 1-4
ADMM Simulated BOD Load Discharge to Outfalls

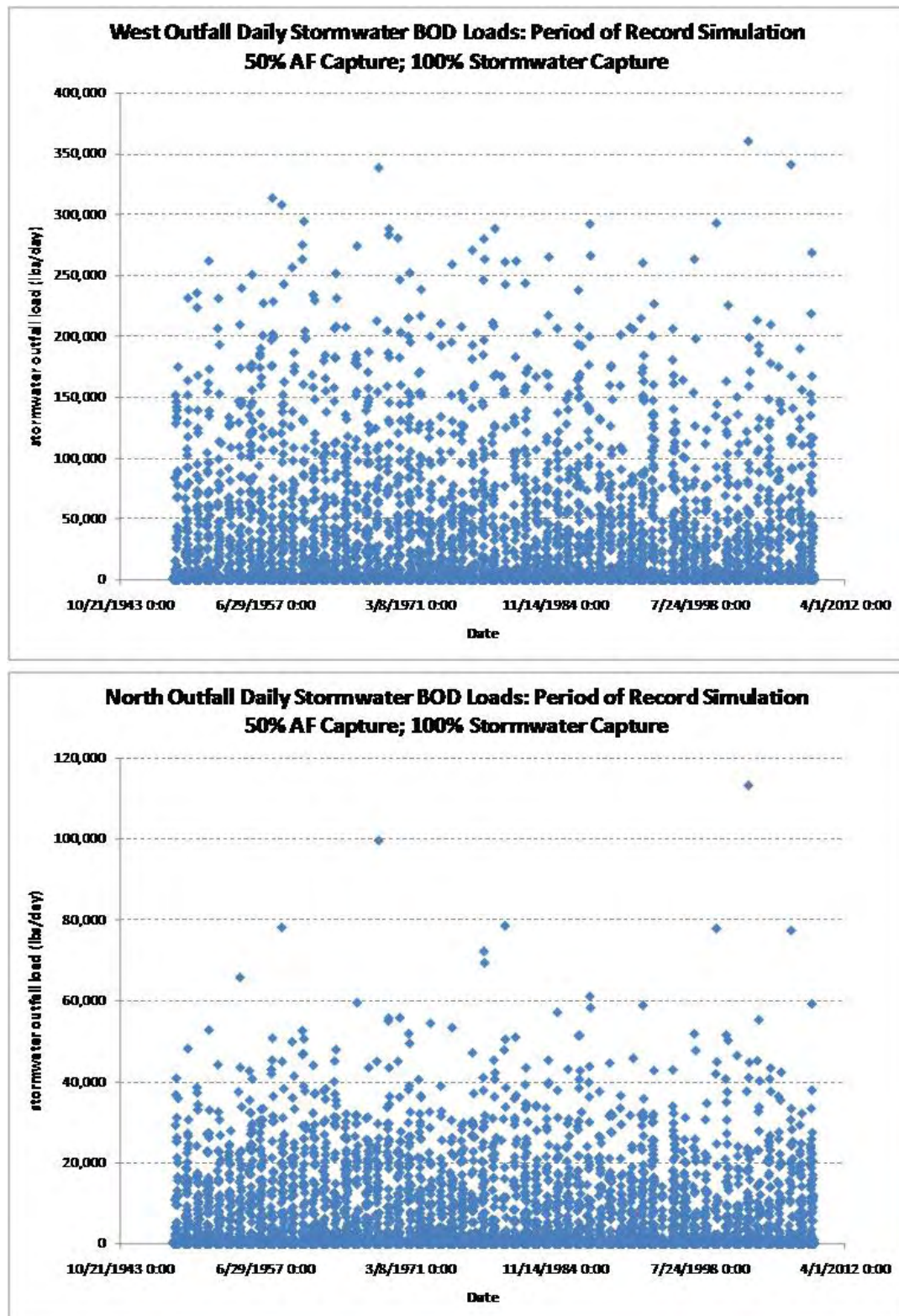


Figure 1-5
Frequency Summary of Daily Outfall BOD Loads

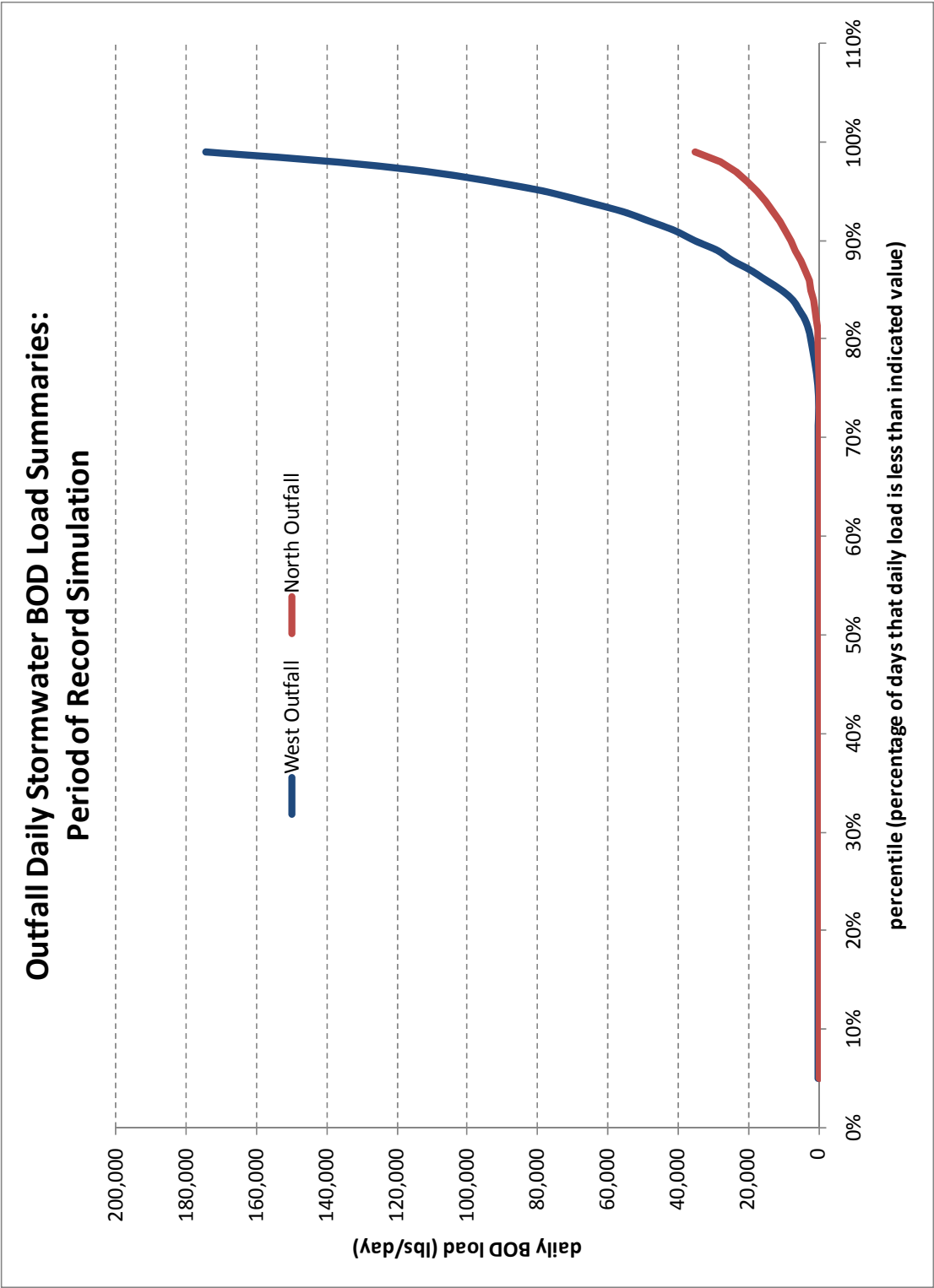
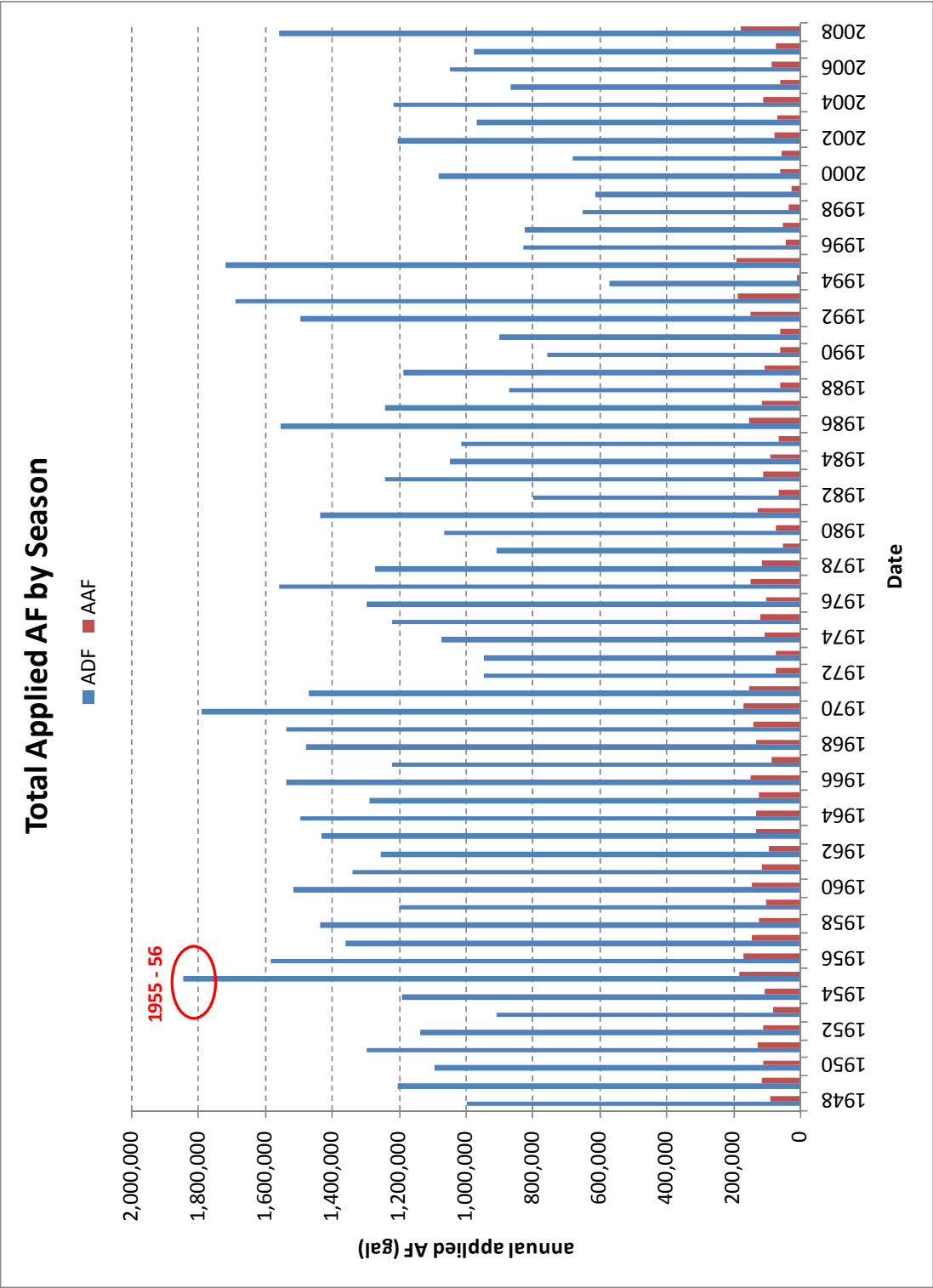


Figure 1-6
Simulated ADF+AAF Applications by Winter Season



Section 2

Modeling of Runoff Storage Needs for Design Winter Season

Based on the simulation of the 61-year period of record weather data, CDM identified the 1993-1994 winter season as the design season to perform more detailed analysis. CDM evaluated this one critical season to quantify storage volumes required to manage deicer runoff at Logan to meet the proposed deicing ELG. CDM evaluated the following two collection scenarios for this design season.

- Collect entire drainage areas from North Outfall and West Outfall, with deicing occurring at gates (current practice)
- Collect drainage only from hypothetical Expanded Juliet Pad, with all deicing occurring at the pad

As stated in Section 1, modeling efforts assumed that 50% of all applied ADF and AAF load and volume would be captured in stormwater runoff, and 100% of the ADF/AAF-containing stormwater runoff volume is captured. The same aircraft departure schedule and fleet mix shown in Table 1-1 were utilized for each collection scenario. Sanitary disposal allowances to the MWRA Deer Island POTW also remain at 32.5 MGD flow and 33,000 lbs BOD load per day.

Application of a total of 1,687,000 gallons of Type I ADF and 184,000 gallons Type IV AAF over the course of the design season was predicted by the model. The model predicted some level of ADF/AAF application on most days; generally from lighter defrost application up to heavier applications from snow/ice precipitation events. This pattern of near-daily application matches closely with recent observed and reported data. The 1993-1994 winter season recorded totals of 30.98 inches of precipitation and 96.3 inches of snowfall from October 1, 1993 to April 30, 1994.

2.1 Outfall Drainage Area Collection of Design Season

Two separate storage facilities would be needed to contain ADF/AAF-contaminated runoff, one in the West Outfall, and one in the North Outfall. The ADMM simulated sanitary disposal to the Deer Island POTW from the two separate storage facilities such that each tank has an opportunity to discharge each day, and the full flow and load discharge allowances would be utilized. Conceptually, a consolidated storage facility (-ies) could be provided along with a pumping transfer station, to manage a single sanitary disposal point. This option was not simulated, but would likely be similar to the sum of the two individual storage tank volume requirements.

Daily results are presented for storage volumes (**Figure 2-1**), load discharged (**Figure 2-2**) and flow discharged (**Figure 2-3**). **Table 2-1** summarizes the key results from this model scenario.

Figure 2-1
Deicing Storage Tank Requirements - Outfall Collection
1993-94 Deicing Season
Boston Logan Airport

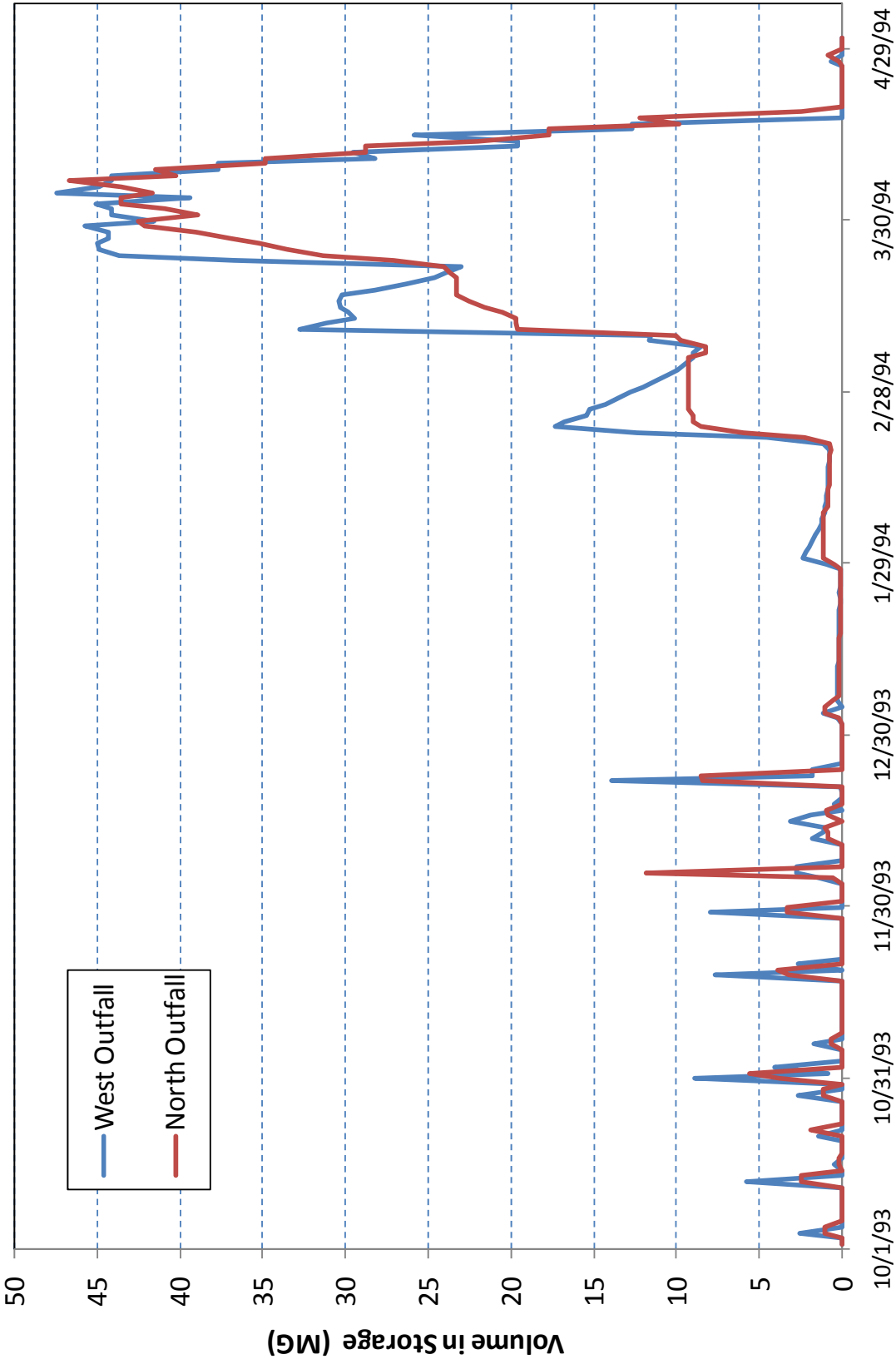


Figure 2-2
Daily Load Discharge to Deer Island POTW - Outfall Collection
1993-94 Deicing Season
Boston Logan Airport

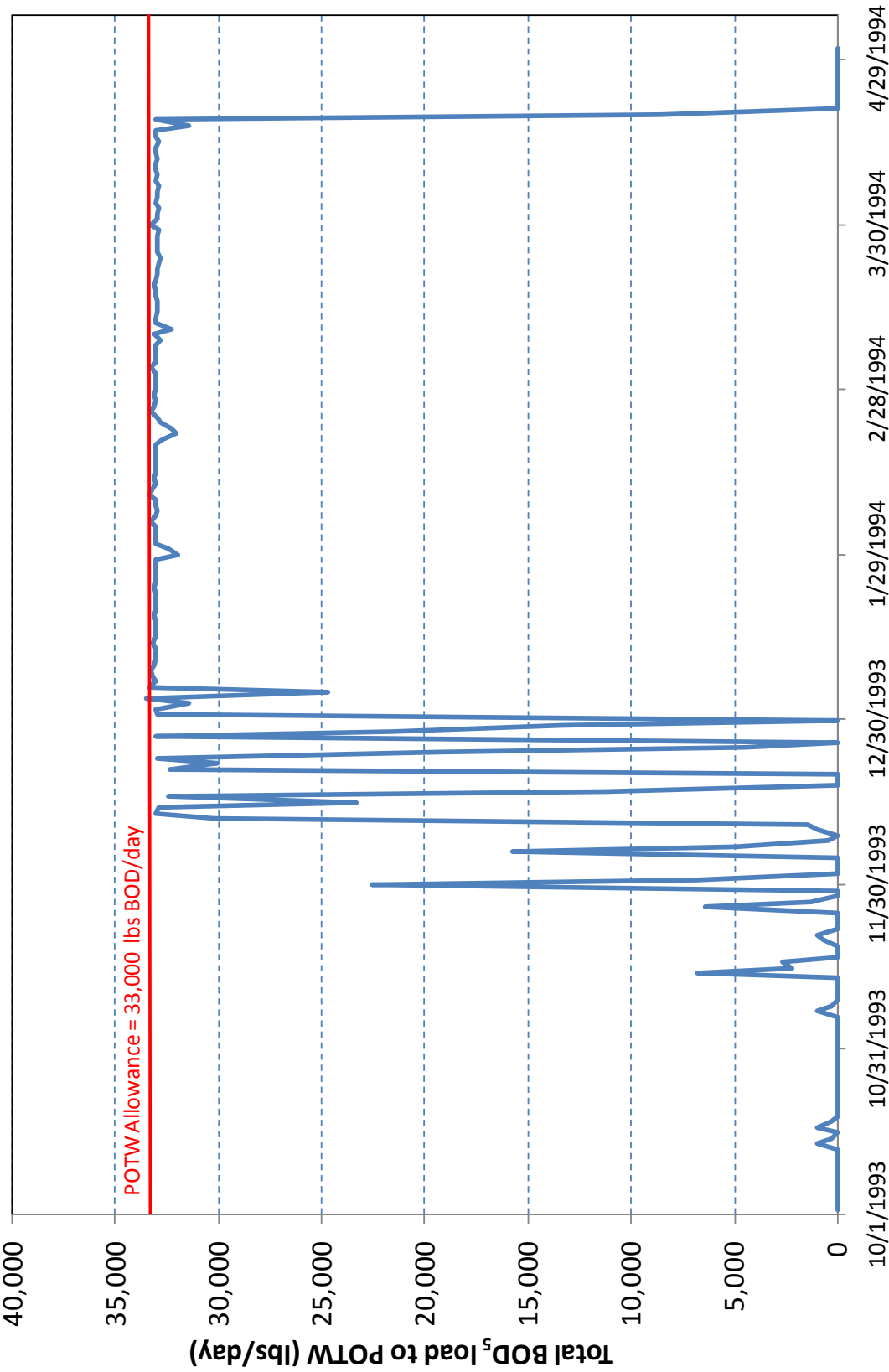


Figure 2-3

Daily Flow Discharge to Deer Island POTW - Outfall Collection
1993-94 Deicing Season
Boston Logan Airport

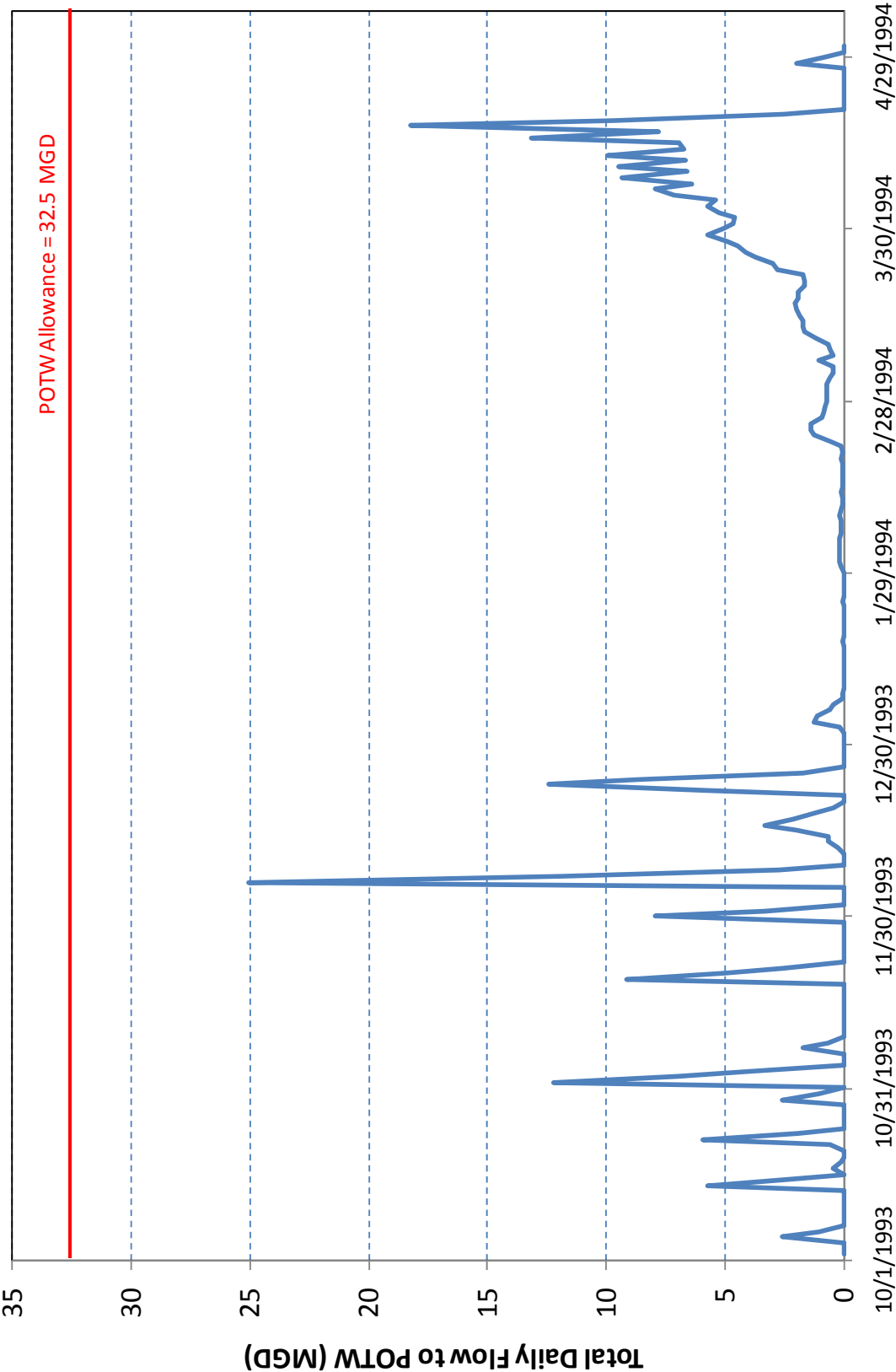


Table 2-1: Design Season Storage and Disposal – Collect Outfall Drainage Areas

Maximum Storage Requirements	47.5 MG (West) 46.7 MG (North)
Total Volume Disposed	391.6 MG
Total Load Disposed	4,020,000 lbs BOD ₅
Maximum Daily Flow Disposed	25.1 MGD
Maximum Daily Load Disposed	33,000 lbs BOD ₅ (limit)

2.2 Deicing Pad Collection of Design Season

The modeling analysis used the expanded Taxiway Juliet deicing pad area of 25.4 acres, all impervious, as provided by CH2M Hill and shown in **Figure 2-4**. A portion of this deicing pad already exists on the eastern end. With expansion to accommodate more aircraft and overall deicing throughput capacity, the drainage would be configured to route flow to a single location to be managed by a new storage tank. The model assumes that all aircraft deicing activities for the entire airport's departures and fleet mix occurs within this limited area. It also makes the simplifying assumption that the pattern of departures during storms would remain consistent with the schedules used to build the model (as described in Section 1).

Daily results for storage volumes (**Figure 2-5**), load discharged (**Figure 2-6**) and flow discharged (**Figure 2-7**) are presented at the end of this technical memorandum. **Table 2-2** below summarizes the key results from this model scenario.

Table 2-2: Design Season Storage and Disposal – Collect Taxiway Juliet Deicing Pad

Maximum Storage Requirements	4.3 MG
Total Volume Disposed	19.1 MG
Total Load Disposed	4,020,000 lbs BOD ₅
Maximum Daily Flow Disposed	1.8 MGD
Maximum Daily Load Disposed	33,000 lbs BOD ₅ (limit)

An additional “three-pad” scenario was considered, but not evaluated in detail. This scenario would collect flow from a larger area, including a proposed North Pad and East Pad, in addition to the expanded Juliet Pad discussed herein. Given the assumption that all deicing would occur with one of these pad collection areas, the total generated deicing loads would be the same. However, the aggregate required storage volume would be greater with collecting the North, East, and Juliet Pads than the expanded Taxiway Juliet Pad alone.

Figure 2-4
Expanded Taxiway Juliet Deicing Pad Collection Area

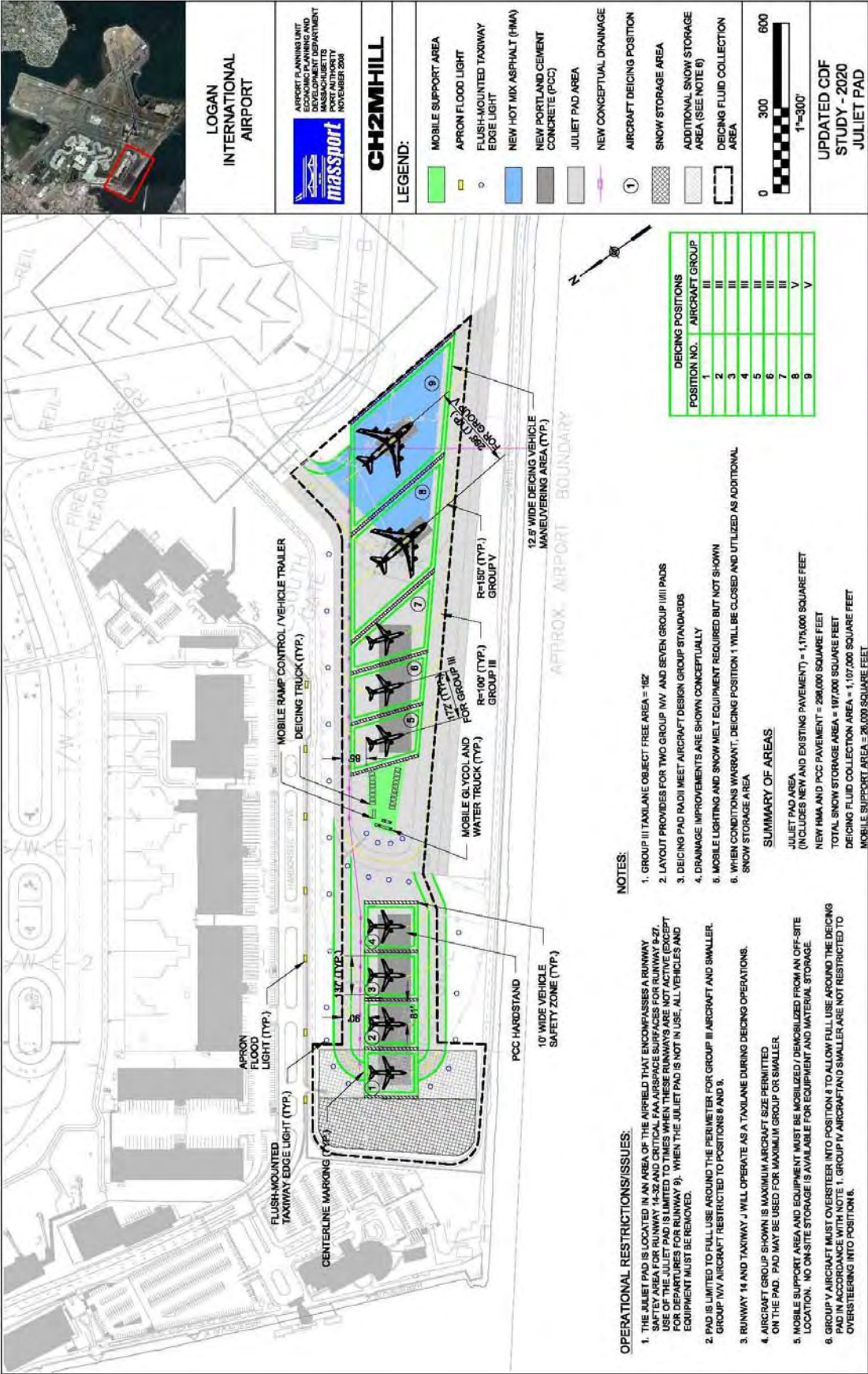


Figure 2-5
Deicing Storage Tank Requirements - Deicing Pad Collection
1993-94 Deicing Season
Boston Logan Airport

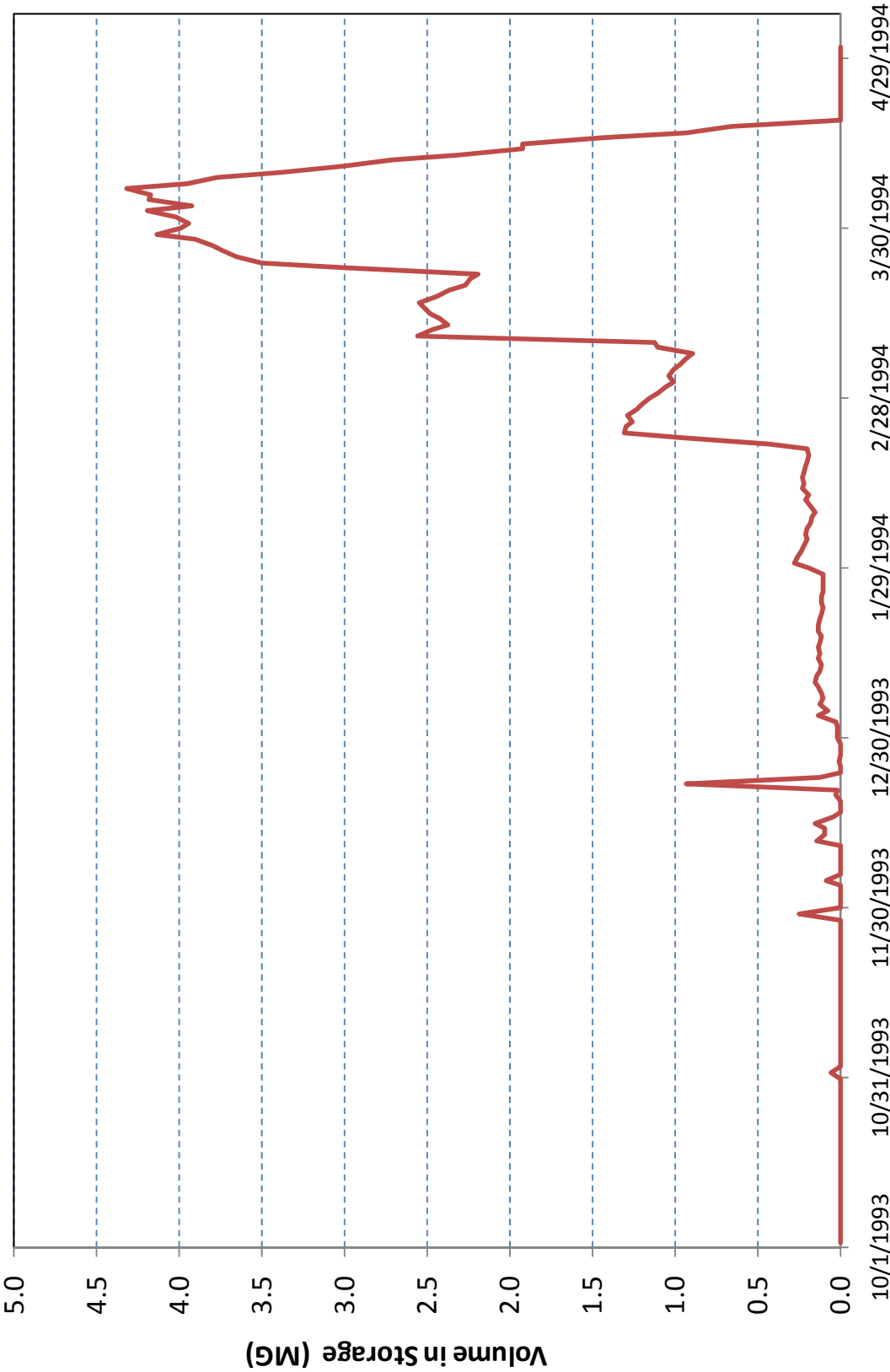


Figure 2-6
Daily Load Discharged to Deer Island POTW - Deicing Pad Collection
1993-94 Deicing Season
Boston Logan Airport

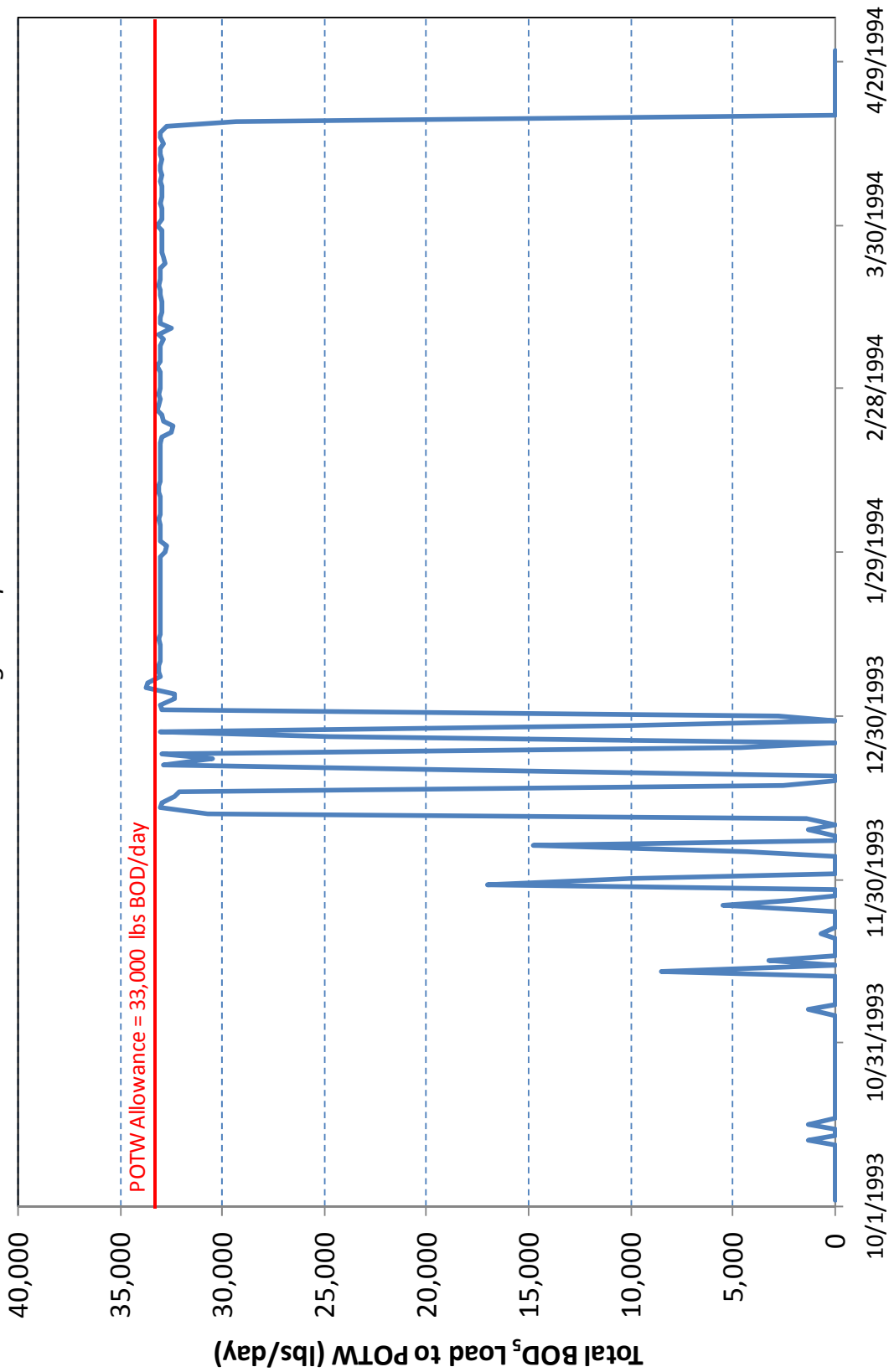
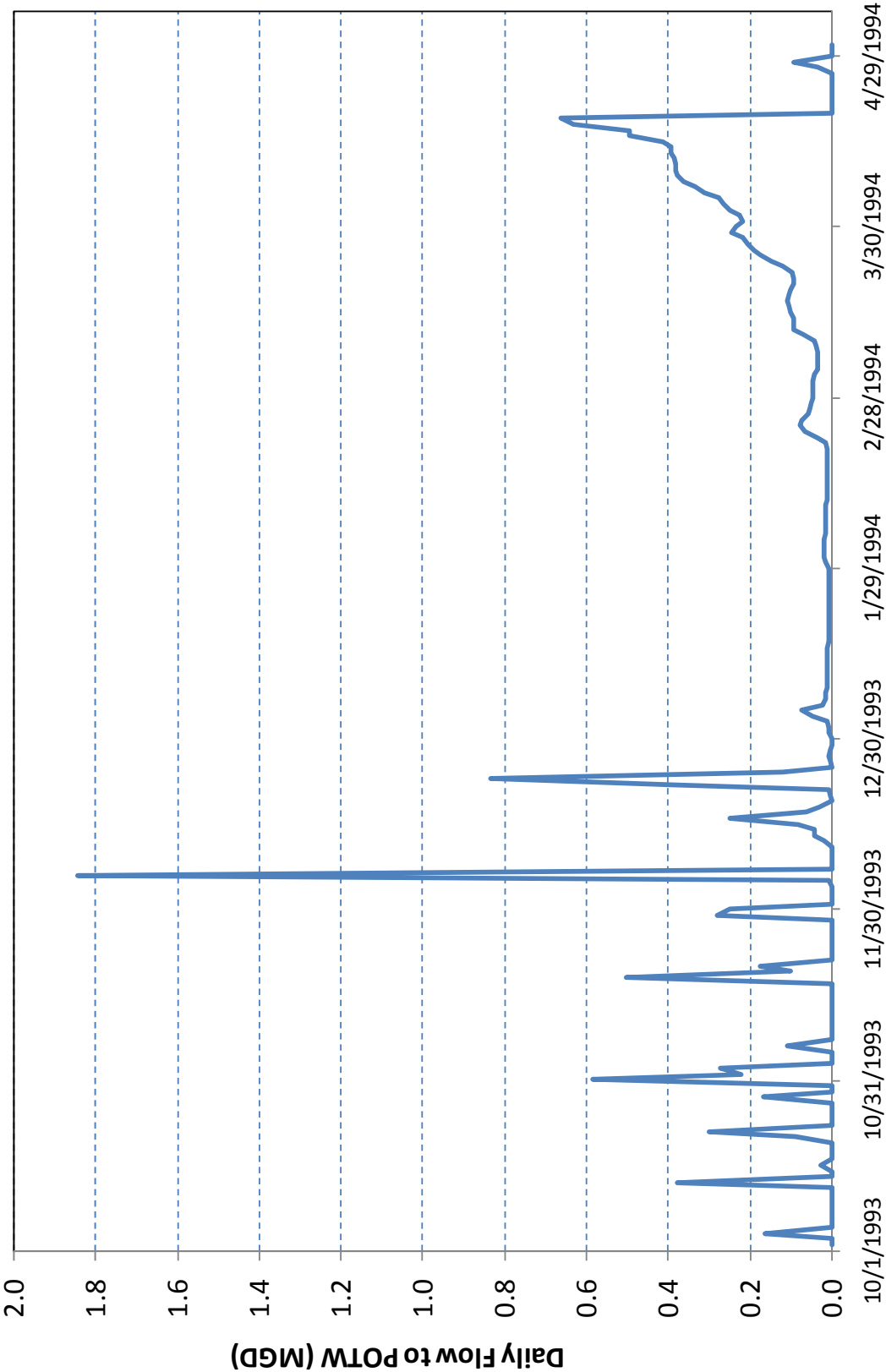


Figure 2-7
Daily Flows to Deer Island POTW - Deicing Pad Collection
1993-94 Deicing Season
Boston Logan Airport



2.3 Conclusion

Collecting all deicing runoff under current practices with outfall collection would require 94.2 million gallons (MG) of storage capacity. Collecting all deicing runoff from the hypothetical Expanded Juliet Pad would require 4.3 MG of storage capacity. If this runoff were stored in the type of large (1.8 MG) storage tanks used at Logan's fuel farm, deicing runoff collection would require the construction of 3 new large storage tanks for the expanded Juliet Pad, or 52 new large tanks for the gate deicing/outfall collection scenario to meet the proposed ELG rule.

Either operational scenario would require additional collection and disposal improvements that would incur significant capital cost to implement, and require Massport to manage the sanitary disposal from storage, which would incur significant operating costs.

The daily flow and load modeling results presented within this report will be used by others to evaluate the feasibility of the anaerobic fluidized bed reactor treatment to meet the Best Available Treatment Technology as proposed in the deicing ELG.

Appendix A

Staff Resumes

Jeffrey R. Macomber, P.E.

Civil/Environmental Engineer

Education

M.S. – Environmental
Engineering, University of
Cincinnati, 2001

B.S. – Civil and Environmental
Engineering, University of
Cincinnati, 1998

Registration

Professional Engineer, Ohio
2003

Mr. Macomber's 11 years of engineering experience includes work with municipal, private, and airport clients. He has specialized in airport deicing management, by providing a range of related services to over 20 airports, including modeling, planning, and detailed design.

Project Engineer, Water Quality Study at Logan International Airport, Boston, Massachusetts. Mr. Macomber serves as the technical lead for a water quality study for deicing discharges, which is required by the airport's NPDES permit. Work included data collection, field monitoring, deicing modeling and calibration to predict deicer usage and quantify design conditions for outfall discharges to receiving waters.

Project Engineer, Glycol Collection System, Port Columbus International Airport, Ohio. Mr. Macomber modeled airport deicing operations to size deicer storage facilities to hold collected deicing waste prior to sanitary discharge. Subsequent design work for the glycol collection system included new on-apron storm sewers, diversion chambers, pump station/equalization tank, 30" force main, two 4.0-mg tanks, and discharge control facilities.

Project Engineer, Evaluation of Minimizing Deicer Discharges at LaGuardia Airport, Port Authority of New York and New Jersey. Mr. Macomber served as the technical lead to evaluate the current deicing practices and quantify the reductions in potential deicing discharges by the airlines' mitigation practices using deicing modeling tools.

Project Engineer, John F. Kennedy International Airport, Port Authority of New York and New Jersey. Mr. Macomber used a proprietary model to simulate the application and discharge of deicing fluids on an outfall-specific basis at JFK for the 2005-2006 winter season. This analysis provided PANYNJ insight on their discharges, and compared these simulated discharges to their upcoming permit renewal limits.

Project Manager, Deicing Pad Feasibility Study at General Mitchell International Airport, Milwaukee, Wisconsin. In response to forecasted growth at MKE, the airport environmental staff sought a study to investigate deicing pads to supplement at-gate deicing and add capacity. Mr. Macomber managed and led conceptual design efforts for five potential deicing pad locations, infrared deicing, and taxiing/queuing analysis as part of an airport-wide deicing pad feasibility study.

Project Engineer, Kansas City International Airport Cargo Glycol Collection System Design. Mr. Macomber performed conceptual and final design for a new glycol collection system for KCI's five cargo ramp areas. The design included new collection piping, two large pump stations, a 24 to 30-inch force main, a 3.0 MG storage tank, and other improvements to the

existing terminal glycol facility. A deicer modeling task helped verify the storage requirements for the combined facility.

Project Engineer, On-Call Environmental Services, Hartsfield-Jackson International Airport, Atlanta, Georgia. As part of CDM's on-call services, Mr. Macomber delivered a presentation to Department of Aviation staff, airlines, and other interested parties, on the US EPA's upcoming Effluent Limitations Guidelines on airport deicing activities.

Project Engineer, 22L Deicing Pad, Detroit Metropolitan Airport, Michigan. Mr. Macomber worked with a multi-firm project team to develop deicer capture conceptual alternatives and executed a fast-track design of a subsurface drainage and collection system for a 5-position pad covering approximately 7 acres with allowances for angled parking in the future.

Project Engineer, Airport Deicer Management, Westchester County, New York. Mr. Macomber helped manage aircraft and pavement deicing issues at the airport for both commercial and corporate aircraft locations. This work entailed developing and modeling load generation and storage requirements for several options including a centralized deicing pad, several independent at-gate deicing locations, and remote deicing pads.

Project Engineer, Atlantic City International Airport Deicer Containment Study, Atlantic City, New Jersey. Mr. Macomber evaluated design winter storms and winter seasons for deicer storage modeling needs. He then modeled infrastructure needs for various deicer-capture scenarios.

Project Engineer, George Bush Intercontinental Airport Deicing Operations Plan, Houston, Texas. For the George Bush Intercontinental Airport (IAH), Mr. Macomber prepared a deicing operations plan to identify detailed methods of deicer containment and eventual disposal. He worked with airport personnel, commercial airline tenants, and cargo carriers to facilitate preferred deicing practices.

Project Engineer, Pittsburgh International Airport Widebody Deicing Pad, Pittsburgh, Pennsylvania. He modeled stormwater drainage for the Taxiway Sierra widebody deicing pad to provide in-line equalization storage and drainage piping for both Phase I and Phase II pad areas, totaling approximately 24 acres of impervious area.

Professional Activities

American Association of Airport Executives – Environmental Services Committee

American Association of Airport Executives – Deicing ELG Taskforce

American Water Works Association

Tim Cox, Ph.D, P.E.

Water Resources Engineer

Education

Ph. D. - Engineering Science,
University of Auckland, New
Zealand, 2005

M. Phil. - Science and
Technology, University of
Waikato, Hamilton, New
Zealand, 1999

M.S. - Environmental and Water
Resources Engineering,
University of Colorado, Boulder,
Colorado, 1997

B.S. - Civil and Environmental
Engineering, Duke University,
1994

Registration

Professional Engineer, Colorado

Specializing in water resources engineering and water quality and quantity modeling, Dr. Cox has extensive experience in the development and maintenance of surface water quality and quantity computer models, as well as the application of many published models. Dr. Cox also has significant experience in stream ecology and ecosystem modeling, water quality and ecology field and laboratory research, and engineering software development.

Airport Deicing Management Model (ADMM). Dr. Cox is the primary developer of CDM's Airport Deicing Management Model (ADMM), which routes stormwater and pollutants associated with deicing fluid through airport sub-catchments while calculating storage requirements and outfall loadings. This model has, to-date, been successfully applied as an aid to airport expansion planning at ten major U.S. airports. An internal R&D project was recently completed, providing a major upgrade to the model.

Responding to Climate Change through Integrated Water Resources Planning. Dr. Cox was the principal investigator on an internal research and development project aimed at developing techniques for incorporating climate change considerations into integrated water resources planning (IWRP). This work focused on adapting an existing IWRP model developed for the City of San Diego to allow for climate change "what if" scenario analysis. Critical to this work is the translation of Global Circulation Model (GCM) climatological predictions (temperature and precipitation), and associated uncertainties, into hydrologic parameters (streamflow and evaporation).

Assabet River Watershed Water Quality Study, Massachusetts. Dr. Cox provided advice and technical assistance on a modeling study investigating the impacts of instream physical alternations on watershed pollutant fate and transport. The project involved the integration of watershed hydrologic and water quality modeling with instream fate and transport modeling. Dr. Cox's contribution focused on review of model hydrologic and hydraulic simulations and refinement of instream nutrient fate and transport modeling, including adapting an existing watershed HSPF model.

Stochastic Modeling of Urban Catchment Loadings. Dr. Cox developed and applied a stochastic approach to stormwater quantity and quality (metals) modeling for the Butte hillside former mining site in Butte, MT. He developed a similar approach for the Santa Ana Watershed Protection Agency (SAWPA) for investigating the effectiveness of various best management practices (BMPs) on bacteria loads in the Santa Ana River.

Boston-Logan International Airport AFB TREATMENT APPLICABILITY REVIEW

Prepared For:

The Massachusetts Port Authority
(Massport)

February 2010

Prepared By:

**Gresham, Smith and Partners
155 East Broad Street
Suite 900
Columbus, Ohio 43215**

GS&P Project No. 27544.00



G R E S H A M
S M I T H A N D
P A R T N E R S



EXECUTIVE SUMMARY

This report evaluates the site-specific feasibility for Boston-Logan International Airport (“Logan”) of the aircraft deicing and anti-icing fluid (“ADF/AAF”) treatment technology identified as Best Available Technology (“BAT”) by the United States Environmental Protection Agency’s proposed Effluent Limitation Guidelines and New Source Performance Standards for the Airport Deicing Category (the “Proposed Rule”). The Proposed Rule identified Anaerobic Fluidized Bed (AFB) systems as BAT for reduction of chemical oxygen demand (“COD”) in runoff containing ADF. COD is a measurement of the extent to which a chemical depletes oxygen in surface water; it is used in the Proposed Rule as an indicator of ADF/AAF concentration. An AFB system uses a series of closed tanks in which ADF-containing stormwater is pumped through activated carbon beds. Bacteria on the carbon particles convert the glycol from the ADF to methane, carbon dioxide, and sludge that is removed and disposed of.

We evaluated the feasibility of treating ADF-containing stormwater runoff with an AFB system at Logan under two treatment scenarios. First, we evaluated the use of AFB in conjunction with implementation of the Proposed Rule’s BAT for ADF collection at airports in Logan’s category, which is to deice all aircraft at a Centralized Deicing Facility (CDF). Second, we evaluated the use of AFB in conjunction with an alternative ADF collection approach, gate deicing with collection of ADF-containing stormwater runoff from all drainage areas where deicing occurs (the “end-of-pipe” scenario). We concluded that it is not feasible to treat all deicing runoff at Logan with an AFB system under either scenario. In essence, much of the “end-of-pipe” runoff would be too dilute for the AFB system to treat, and much of the CDF runoff would be too concentrated.

The report also estimates site-specific costs of constructing an AFB system at Logan under each of the two scenarios assuming the system would function in conjunction with other treatment or disposal. We concluded that such a system would cost \$53.5 million under a CDF scenario and \$61.2 million under an end-of-pipe scenario. For a three pad scenario the cost of AFB treatment would likely be equal or even greater due to the larger volume of runoff being processed, as well as, more COD load being treated due to more runoff at COD concentrations within acceptable ranges. However, these costs do not include the substantial additional costs of treating the portion of runoff that could not be treated by the system, which would have to be sent to a glycol recycling facility or a publicly owned treatment works.

Finally, the report discusses three fundamental flaws in EPA’s analysis of AFB that have implications for all airports for which AFB was identified as BAT: (1) failure to distinguish between Total COD and Soluble COD; (2) simplistic assumptions about the operation of AFB systems; and (3) failure to acknowledge that an appropriately operated AFB system may exceed EPA’s specified effluent limits. Based on these incorrect analyses, EPA has mandated effluent limits that may not be feasible for airports to meet.



A. LOGAN-SPECIFIC ANALYSIS

What follows is an analysis of the key issues associated with implementing AFB technology at Logan.

1. Feasibility of AFB Treatment at Logan

Camp, Dresser & McKee (CDM), in its report Deicing Runoff Modeling – February 2010, modeled hypothetical scenarios for collection of ADF-containing runoff and simulated the potential characteristics of ADF-containing runoff that would be generated during a “design season”¹ selected to represent the upper end of simulated runoff volume. Two hypothetical collection scenarios were studied: collection of runoff from a Centralized Deicing Facility (CDF) (the Proposed Rule’s BAT), and collection of runoff from all drainage areas in which deicing is currently conducted (“end-of-pipe” collection, a possible alternative to the specified BAT).

- Centralized Deicing Facility (CDF): Collect drainage only from the hypothetical expanded Juliet Pad (described in an accompanying memorandum by CH2M Hill) during deicing events, with all deicing occurring at the pad.
- End of Pipe Collection: Collect entire drainage areas from the North Outfall and the West Outfall during deicing events, with deicing occurring at the gates (current practice).

For each of these scenarios, GS&P evaluated the feasibility of treating the runoff modeled by CDM with an AFB system. An AFB system utilizes fluidized particles on which anaerobic microorganisms grow and consume pollutants in water. The treatment rate of an AFB system is dependent on the space available for microorganism growth (reactor volume). Once an AFB system is built, efficient operation of that system can be obtained by providing a constant load to the microorganism population, thus enabling a stable and healthy population. Since concentrations of runoff can be variable at airports, influent flow rates for AFB systems must be changed depending on the concentration to provide a constant loading to the reactor (i.e., microorganisms).

1.1 Centralized Deicing Facility Collection

CDM’s modeling estimated that collection of all ADF-containing stormwater from the Expanded Juliet Pad during the design season would result in influent with the following characteristics into the AFB treatment system:

¹ The concept of “design season” is an extension of the engineering concept of a “design storm,” which is a hypothetical severe weather event used to determine the proper capacity of a collection or treatment system.



- Range of Runoff Concentrations = 0 to 500,000 mg/L BOD² (850,000 mg/L COD)
- Total Annual Runoff Collected = 19.1 Million Gallons
- Total Annual BOD Load Collected = 4.0 Million Pounds
- Total Estimated Storage Needed = 4.3 Million Gallons

GS&P's analysis of the CDM modeled daily flow and load values showed that a treatment system capable of treating approximately 33,000 pounds of BOD per day would be required for the design season. While AFB treatment systems can be designed to treat that daily load rate, the extreme high BOD concentrations simulated by CDM's modeling of the CDF scenario present significant operational problems, as described below.

AFB treatment systems operate at a nearly constant loading rate (pounds COD or BOD per day). Because deicer runoff concentrations at airports can be highly variable, airport AFB treatment systems must adjust influent flow rates to achieve the necessary constant loading rate. The lower the concentration of deicer in the influent flow to an AFB treatment system, the higher the necessary flow rate. Conversely, the higher the concentration of deicer in the influent, the lower the necessary flow rate to maintain a constant loading rate. Therefore, the CDF collection scenario at Logan, with its very high concentrations of influent into the AFB treatment system, would require very low flow rates into the system.

AFB treatment systems also produce solids as a byproduct of the treatment process. The solids are removed from the treatment train and disposed of. The rate of solids removal is dependent on the loading rate and is therefore nearly constant for an AFB treatment system. Normally, influent flow rates are high enough to cause the solids removal to be a small percentage of the overall discharge. As stated previously, as the influent BOD concentration to the AFB treatment system increases, the influent flow rate decreases. If the influent flow rate decreases to less than the rate at which solids are removed from the system, more volume will be leaving the system than entering the system. This will cause the system to no longer operate in equilibrium and eventually make fluidization and treatment impossible.

The concentration at which the influent flow rate will cause operational concerns for the solids removal process is greater than 75,000 mg/L BOD (128,000 mg/L COD). Therefore, runoff concentrations above 75,000 mg/L BOD are not appropriate for influent into an AFB treatment system for significant periods of time. See **Attachment 1** for further explanation showing the high concentration limit of influent into AFB systems.

Analysis of the simulated daily flows and loads from the airport deicer modeling of the CDF showed that during the design season, significant volumes of runoff with

² Biological oxygen demand ("BOD") is, like COD, a way of measuring the amount of oxygen-depleting substances in water.



concentrations greater than 75,000 mg/L BOD were present. According to the simulations, over 1.2 million gallons of collected runoff (6% of total annual runoff) had concentrations greater than 75,000 mg/L BOD (COD of 128,000 mg/L), which contained 56% of the BOD load for the season. Therefore, 94% of the volume and 44% of the annual load could be feasibly treated by an AFB system. The CDF scenario does not reflect current deicer runoff characteristics.

Because collected runoff concentrations from a CDF at Logan would often greatly exceed the concentration limits of an AFB treatment system, an AFB treatment system alone is not a feasible technology for treatment of deicing runoff at Logan. Therefore, EPA's determination of BAT for treatment of deicing runoff for Logan as an AFB treatment system appears to be fatally flawed, given that EPA has determined that CDFs are BAT for deicing runoff collection at this size of airport.

1.2 End of Pipe Collection

CDM's modeling estimated that the collection of all ADF-containing stormwater from the areas at Logan at which deicing is currently conducted would result in influent with the following characteristics into the AFB treatment system during the design season:

- Range of Runoff Concentrations = 0 to 80,000 mg/L BOD (136,000 mg/L COD)
- Total Annual Runoff Collected = 391.6 Million Gallons
- Total Annual BOD Load Collected = 4.0 Million Pounds
- Total Estimated Storage = 94 Million Gallons

GS&P's analysis of the CDM modeled daily flow and load values showed that a treatment system capable of treating approximately 38,000 pounds of BOD per day would be required for the design season. While AFB treatment systems can be designed to treat that daily load rate, the extreme high volumes of runoff with low BOD concentrations predicted under this scenario present a different set of operational problems than treatment of the very high BOD concentrations in the CDF scenario.

As discussed above, because AFB treatment systems operate at a nearly constant BOD or COD loading rate, the influent flow rate is dependent on the influent concentration. As the influent concentration decreases, the influent flow rate must increase to feed the same daily load to the system. At low concentrations (less than 1,200 mg/L BOD) the necessary influent flow rate to the AFB treatment system becomes too high to support efficient operation of the system. At these low concentrations, the amount of methane generated by the anaerobic treatment will not be sufficient to supply the heat requirement to sustain the temperature required. Therefore, significant amounts of natural gas would be required to heat the influent runoff and maintain efficient treatment. Additional natural gas was not included in EPA's description of the BAT and was also not included in the economic analysis.



Analysis of the simulated flows and loads for the end-of-pipe collection scenario showed that approximately 331 million gallons would be unsuitable for treatment by the AFB treatment system because of low BOD concentration. Approximately 75% of the annual BOD load, and 15% of the annual runoff volume, could be sent to the AFB treatment system. The remaining 25% of the annual BOD load, and 85% of the annual runoff volume, would require a different method of treatment or disposal.

Because BOD concentrations in runoff from the end-of-pipe collection scenario would be too low for efficient treatment by an AFB treatment system, an AFB treatment system alone is not a feasible technology for treatment of deicing runoff at Logan under this collection scenario. Thus, EPA's designated treatment BAT is not feasible as the only treatment technology at Logan for either of the collection scenarios that would comply with the Proposed Rule's mandate of 60% of collection of available ADF.

2. Costs of AFB Treatment at Logan

As stated above, EPA's assumption that AFB treatment is able to manage all runoff at Logan appears to be fatally flawed. Therefore, preliminary estimates of the cost to implement AFB treatment at Logan must take into account the cost of treating the runoff that cannot be sent to the AFB. Below, we provide a preliminary order of magnitude opinion of probable cost for installing an AFB system and discuss possible alternative treatment options.

2.1 Centralized Deicing Facility Collection

For the CDF scenario at Logan, GS&P estimated that an AFB treatment system capable of treating 33,000 pounds of BOD per day would be required to treat the runoff with concentrations less than 75,000 mg/L BOD. An AFB treatment system of that size would cost approximately \$53.5 million dollars and require a footprint of approximately 6 acres. This preliminary cost opinion includes the following factors:

- Site Work
- Building Costs
- Treatment Equipment
- Laboratory Equipment
- Instrumentation and Methane Control
- Mechanical
- Electrical, Programming, and Monitoring
- Soft Costs of:
 - 5% Insurance, Bond & Mobilization
 - 10% Overhead
 - 20% Engineering
 - 15% Profit
 - 30% Contingency



Opinions of Cost broken down for individual categories are shown in **Attachment 2**. The cost opinion does not include all of the components, which could significantly increase total costs for installation of AFB treatment at Logan. Some of the known missing components include:

- Collection System Modifications
- Storage Facilities
- Piping from CDF to Storage Facilities
- Piping from Storage Facilities to Treatment Facilities
- Piping from Treatment Facilities to Outfall Discharge Point
- Site Constraints (e.g., Utility Improvements, etc.)
- Land Availability, Cost and Lost Opportunity Cost
- Site-Specific Conditions

Because this \$53.5 million dollar AFB treatment system could treat less than half of the annual load expected at Logan, additional treatment would be required to treat the rest of the expected runoff. For runoff with such high BOD concentrations, a recycling facility might be appropriate, but would require additional infrastructure (i.e., cost) and land space.

Another theoretical option to satisfy the Proposed Rule's treatment requirements is slow metering of the concentrated runoff to a publicly owned treatment works (POTW) such as MWRA's Deer Island Treatment Plant. However, a POTW may not accept runoff with such high concentrations of BOD. If the runoff were allowed to be metered to the POTW, additional storage would be required to hold that runoff before discharge, and the size of that storage would be dependent on the POTW's load limits. This additional storage and discharge to the POTW would also incur additional capital and operational costs and require additional land space.

2.2 End of Pipe Collection

For the end of pipe collection scenario at Logan, GS&P estimated that an AFB treatment system capable of treating 38,000 pounds of BOD per day would be required to treat the runoff with concentrations greater than 1,200 mg/L BOD. An AFB treatment system of that size would cost approximately \$61.2 million dollars and have a footprint of approximately 6 acres. This opinion includes and excludes the same factors as described in the CDF scenario. Preliminary order of magnitude cost opinions for individual categories are also shown in **Attachment 2**.

The \$61.2 million dollar AFB treatment system would be appropriate for treating approximately 75% of the total annual load but only 15% of the annual runoff volume. The remaining 85% of runoff volume (approximately 331 million gallons per season) is simulated to contain concentrations of less than 1,200 mg/L BOD. This low



concentration, high volume runoff cannot be feasibly treated with an AFB treatment system; thus, an additional treatment option would be necessary. A potential option is to discharge the low concentration runoff to a POTW; however this option may have significant cost and operational implications. High volume runoff events at Logan coincide with high precipitation events. The POTW may not accept high volumes from Logan during and shortly after precipitation events when the POTW's system may already be near capacity. Therefore, Logan could be required to hold large volumes of runoff and meter it to the POTW, which would necessitate larger storage tanks, more land and additional costs.

2.3 Three Pad Scenario

For a three pad scenario at Logan, GS&P was not tasked with providing preliminary opinions of cost for this scenario. However, a three pad scenario would likely results in higher volumes of runoff being collected as well as more volume of runoff and COD or BOD load at concentrations within the acceptable COD or BOD concentration range for onsite AFB treatment. Therefore, it is highly likely that the costs for onsite AFB treatment would be at least equal and possibly even higher than the costs for the Juliet pad scenario alone.

B. FLAWS IN EPA'S ANALYSIS OF AFB APPLICABLE TO LOGAN AND OTHER AIRPORTS

In addition to the Logan-specific problems with AFB treatment we have identified, there are a number of general flaws in EPA's analysis of AFB technology. We explain these below and discuss their implications for Logan.

1. EPA's Must Reconcile Whether Its Data Analysis and Basis for Effluent Limits Is Total COD or Soluble COD

In the Proposed Rule, EPA sets chemical oxygen demand (COD) limits of 271 mg/L daily maximum and 154 mg/L weekly average in effluent discharged from treatment systems to surface waters. Throughout the Proposed Rule and supporting documents, the limits are described simply in terms of COD without explaining whether the basis for that measurement is total COD or soluble COD, an important distinction. EPA must clearly explain whether total or soluble COD data was used as the basis for establishing the COD limit and whether total or soluble COD is the intended effluent limit parameter. In addition, the difference between these two parameters must be reconciled in EPA's analysis.

The issues relative to specification of Total or Soluble COD are as follows:

- The effluent data from the Albany International (ALB) AFB used by EPA was in terms of Soluble COD



- The selection of the AFB as BAT by EPA appears to be based strictly on the AFB bioreactor and the systems that support the biological activity. Handling of biosolids is a separate technology, as evidenced by the ALB system where the solids handling systems are not directly connected to the AFB. No reference is made to solids handling systems in the draft rule.
- If the effluent limit were specified in terms of Total COD, provisions would need to be made by an airport for a solids handling system. There is no information to suggest that costs for solids handling (which are very site specific) are included in EPA cost estimates.
- Because of the high concentrations of deicer in runoff at Logan, significant solids removal, not included as part of the BAT, would be required to meet Total COD limits.
- Local permitting authorities may base NPDES effluent limits on Total COD, instead of Soluble COD, which would impose a more restrictive discharge limit on Logan than EPA may intend.

Details of the analysis of the Soluble COD issue are presented below.

Soluble COD is the COD of liquid fraction (i.e., the fraction passing through a filter used in a suspended solids test). Total COD is the COD of the liquid fraction plus the COD of any solids in a sample. Soluble COD is the parameter used by the existing AFB systems (ALB and Akron-Canton Regional (CAK) Airports) to measure the performance of their AFB systems. Soluble COD is used because:

- The freezing point depressants in aircraft deicing fluids (propylene glycol, ethylene glycol, glycerin) are highly soluble. As a result, the COD in the stormwater collected from airports is almost entirely soluble. Only small amounts of suspended solids typically result from wash off of non-deicing pollutants. The Proposed Rule addresses only contaminants associated with deicing operations, not with non-deicer constituents associated with materials washed from the airport surface.
- Total COD concentration measurements in the treated effluent, which include measurement of the biosolids fraction, are highly dependent upon treatment system flow rate. Treatment system flow rate can be highly variable within a given AFB system due to the significant variation in influent soluble COD concentration and the need to operate the AFB systems at a near constant soluble COD load. The high concentrations of deicer runoff at Logan would necessitate relatively low treatment system flow rates. These low flow rates would cause significantly higher total COD concentrations at Logan that would be expected at airports with lower influent concentrations, such as at ALB.



It appears that EPA unknowingly used soluble COD data in its analysis. The supporting document titled “Long Term Data from ALB with EPA Comments” includes the daily effluent concentrations from each of the anaerobic fluidized bed reactors at the existing ALB AFB treatment system. According to this document, the values for effluent concentration are in “S COD (mg/L),” which we interpret to mean soluble COD. We have also confirmed with individuals familiar with the ALB system that the COD measurements taken and reported in the referenced document are, in fact, in terms of soluble COD.

EPA then used the soluble COD data to establish COD effluent limits and conduct cost-benefit analyses for the Proposed Rule. This leads to a number of problems. Such analyses result in a technically inaccurate representation of ALB AFB treatment system performance and inappropriately add a solids removal requirement to the BAT. Use of “COD” alone will likely be interpreted as “total COD” by permit writers. Since EPA, in fact, used soluble COD as its basis for development of the proposed effluent limits, any proposed limits should be in terms of soluble COD.

Failure to make this change would be technically inconsistent and extend the basis for the treatment BAT from only the AFB unit itself to the biosolids handling system. The biosolids handling system at ALB does not immediately follow the anaerobic fluidized bed reactor; therefore, there is no data from ALB from which a BAT for solids removal standard could be established. Also, because the biosolids handling system is very site and concentration dependent, if there was a biosolids handling system at ALB, we would not expect the system to be an appropriate reference for Logan due to the extreme differences in expected influent concentrations.

2. EPA Misinterpreted Anaerobic Fluidized Bed Treatment Systems in Establishing the Proposed Effluent Concentration Limits.

In establishing the proposed COD limits, EPA made several inaccurate simplifying assumptions with regards to anaerobic fluidized bed (AFB) treatment systems in their development of effluent limits. Data is presented below indicating that EPA needs to perform a more in depth analysis of AFB performance data in assessing potential effluent limits. The following two assumptions are challenged:

- The assumption that there is no relationship between treatment influent characteristics and effluent concentrations
- The assumption that the ALB data represents enough of a range of deicing, operating and compliance conditions to be representative of the model technology

A discussion of the EPA assumptions and their impacts are presented below.



2.1 Influent Soluble COD Loading Rates Impact the Effluent Concentrations from an AFB Treatment System Under Certain Critical Circumstances.

On page 14-5 of the TDD for the Proposed Rule, EPA concludes that a well-operated and designed AFB treatment system should be capable of treating deicer runoff to a narrow range of effluent concentrations despite variation in influent COD concentrations. In drawing this conclusion, EPA determined that influent COD concentrations do not directly affect effluent concentrations for an AFB treatment system. However, this determination is only correct under a limited set of operational circumstances. Since an AFB treatment system at Logan is not expected to operate under the same circumstances as the AFB system at ALB, a Logan AFB may not achieve similar effluent concentrations to the AFB ALB. EPA neglected to fully assess the relationship between influent loading rate (pounds of COD/day) and effluent COD concentration. Also, since EPA's data is based off of only one site's influent characteristics, it failed to identify potential issues at airports with significantly different influent characteristics. These oversights resulted in the establishment of proposed effluent COD limit values that are lower than an appropriate analysis of the available AFB system data supports.

The relationship between influent COD load and effluent COD concentration is critical in the design and operation of AFB systems. In assessing this relationship, it is important to understand that the COD load is the mass of materials contributing to COD that pass into treatment in a given time period (e.g., pounds of COD per day). COD load is calculated by multiplying COD concentration by the flow rate. If a constant COD load is desired when COD concentrations are variable, any increase in concentration must be offset by a proportional decrease in flow rate.

The AFB systems at ALB, CAK, Portland International (PDX), and many industrial operations are designed to operate at a near constant influent COD load. Operation at a near constant influent COD load is desirable because it results in a more stable bacterial population, improving the treatment efficiency and increasing the predictability of system effluent. Increasing operational predictability decreases the risk of non-compliance.

Operating AFB systems to treat collected deicer runoff in an aviation setting, as opposed to treatment in other industrial settings, requires additional control measures to achieve near constant COD load because of the wide fluctuation in COD influent concentrations. The controls are designed so that influent COD concentrations are measured on an ongoing basis and the flow rates influent to treatment are adjusted to achieve the desired COD load. The variation in the influent collected COD concentrations is often too great to achieve constant COD simply with storage based equalization.

Review of the influent and effluent COD data from the ALB AFB treatment system on a season-by-season basis reveals that on an average seasonal basis, the influent COD loadings to the ALB reactors varied significantly over the nine seasons of influent data that is available (from 3,279 lbs COD per day to 8,865 lbs COD per day). ALB

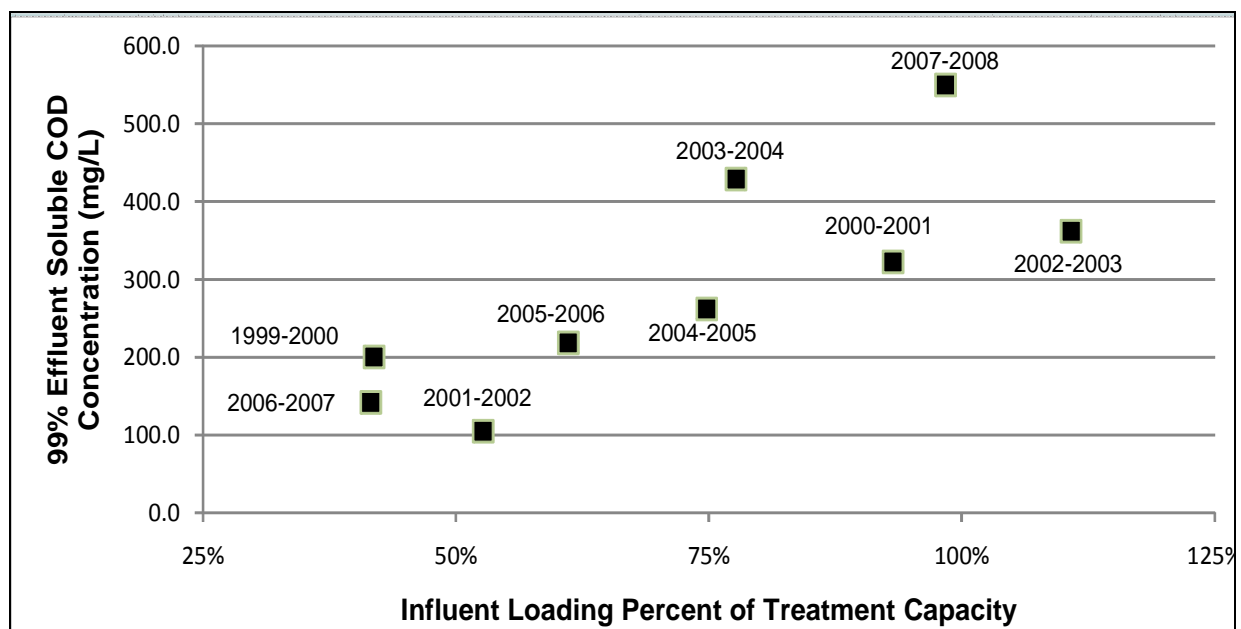


presumably operated with different loadings in different seasons as needed to meet their operational and compliance needs. It is likely that an AFB system at Logan would also have variable average seasonal influent loadings as it responds to variable deicing conditions.

When the COD influent loading data at ALB is compared to the COD effluent concentrations at ALB, a relationship between COD loading and COD effluent concentrations emerges. In particular, when the average influent COD loading is well below the COD loading capacity of the AFB reactors, the average seasonal effluent concentrations are lower. When the average COD influent loading is close to the COD loading capacity of the reactors, the effluent concentrations are higher.

The results of the season-by-season data analysis at ALB are shown in the figure below. The graph plots the average seasonal influent COD at ALB in relationship to the average seasonal 99 percentile effluent COD concentration. The COD influent loading is shown as a percentage of the maximum reactor COD loading treatment capacity (as determined from the volumetric capacity of the reactors). For each season, the 99th percentile effluent concentration was calculated using the same methodology and excluding the same periods described in the EPA analysis.

Figure 1. 99% Effluent Concentration and Average Influent Loading Rate by Season at the Albany AFB Treatment System





The disparity in the effluent concentrations in relationship to the degree to which a reactor is loaded invalidates EPA's assumption that there is no relationship between influent conditions and effluent concentration. It also invalidates the data set used by EPA to calculate effluent limits.

An alternative means of calculating potential limits that factors in the effluent of influent COD load should be considered. The data provided in the above graphic provides a basis for a more appropriate means. The data suggest that use of performance data when the system was loaded well below its average capacity provide an unrealistic representation of the system performance. In particular, for the four seasons in which influent COD loading rates were less than 75%, the effluent concentrations were less than half the value of the effluent concentrations at ALB for the seasons when influent COD loading rates were near the system capacity. By utilizing the entire range of data and ignoring the relationship to influent COD loadings, EPA is, in effect, either forcing airports to operate at less than their loading capacity (thereby requiring more storage) and/or forcing airports to build larger treatment systems than were accounted for in their cost analysis.

If only the data in which influent loadings were within 25% of the load capacity were used, the 99th percentile concentration for daily limits would be 346mg/L, with the 97th percentile concentrations for weekly effluent limits would be 174 mg/L based only on the ALB data.

2.2 EPA's Assumption that the ALB Data was Representative of the Range of Potential Site Conditions is Flawed and Affects the Effluent Limit Calculation.

The analysis presented above showing the relationship of influent loading to effluent concentration was performed only on ALB data. EPA was unable to include data from an AFB treatment system at an airport with pad collection, as may be considered for Logan. Since EPA performed its analysis, the first full season of operational data from the Akron-Canton Airport (CAK) AFB system (2008-2009) has become available. The CAK deicer management system differs from the ALB system in that deicing collection is performed on deicing pads and in that the storage volume for collected deicer is considerably less and the influent flow rates have considerably higher concentrations. Both the ALB and CAK systems have been able to achieve COD removal rates of greater than 99.5% and meet their compliance requirements.

In an attempt to analyze the effect of those differing design, operational, and compliance conditions on effluent limits, the average influent COD loadings and average COD effluent limits from CAK were incorporated into the loading-effluent concentration analysis performed on the ALB data as described above. Based on EPA's analysis that each reactor is considered a separate facility, incorporation of the CAK data into the effluent limit analysis simply adds additional facilities to the data set.



The table below shows the values for the 99th percentile effluent soluble COD concentration from each of the ALB reactors considering only the five seasons that fell within 25 percent of the reactors maximum COD loading rate capacity as well as the 99th percentile effluent soluble COD concentration from each of the two reactors at the CAK system from the 2008-2009 deicing season. The 99th percentile values shown below were calculated using the methodology described in the TDD.

Table 1. 99th Percentile Soluble COD Effluent Concentrations from Each Treatment Reactor

Treatment Unit	Number of Daily Values	99 th Percentile Soluble COD Effluent Concentrations (mg/L)
ALB R-101	651	453
ALB R-102	634	238
CAK R-601	229	640
CAK R-602	229	432
Median Value		443

When the results from all reactors are assessed using the EPA methodology, the results indicate a 99th percentile effluent concentration of 443 mg/L soluble COD, which is substantially higher and more appropriate than the value of 271 mg/L soluble COD established in the proposed rule.

The same set of data used to recalculate the 99th percentile daily effluent concentrations was used to recalculate the 97th percentile weekly effluent soluble COD concentrations from each of the four reactors for which data exists. The table below shows the 97th percentile effluent concentrations utilizing only seasons operated within 25 percent of the reactors capacity and calculated using the same methodology described in the TDD.

Table 2. 97th Percentile Soluble COD Effluent Weekly Average Concentrations from Each Treatment Unit

Treatment Unit	Number of Weekly Averages	97 th Percentile Soluble COD Effluent Concentrations (mg/L)
ALB R-101	111	191
ALB R-102	107	156
CAK R-601	33	422
CAK R-602	33	417
Median Value		304

The results show a 97th percentile soluble COD concentration of 304 mg/L soluble COD, which is significantly higher and more appropriate than the 154 mg/L soluble COD presented in the proposed rule.



These results suggest that site specific considerations and operational decisions have an impact on the calculated effluent limits in the proposed rule. The results also suggest that since influent characteristics at Logan may be more similar to those at CAK than at ALB, an AFB treatment system at Logan may produce effluent concentrations similar to those at CAK.

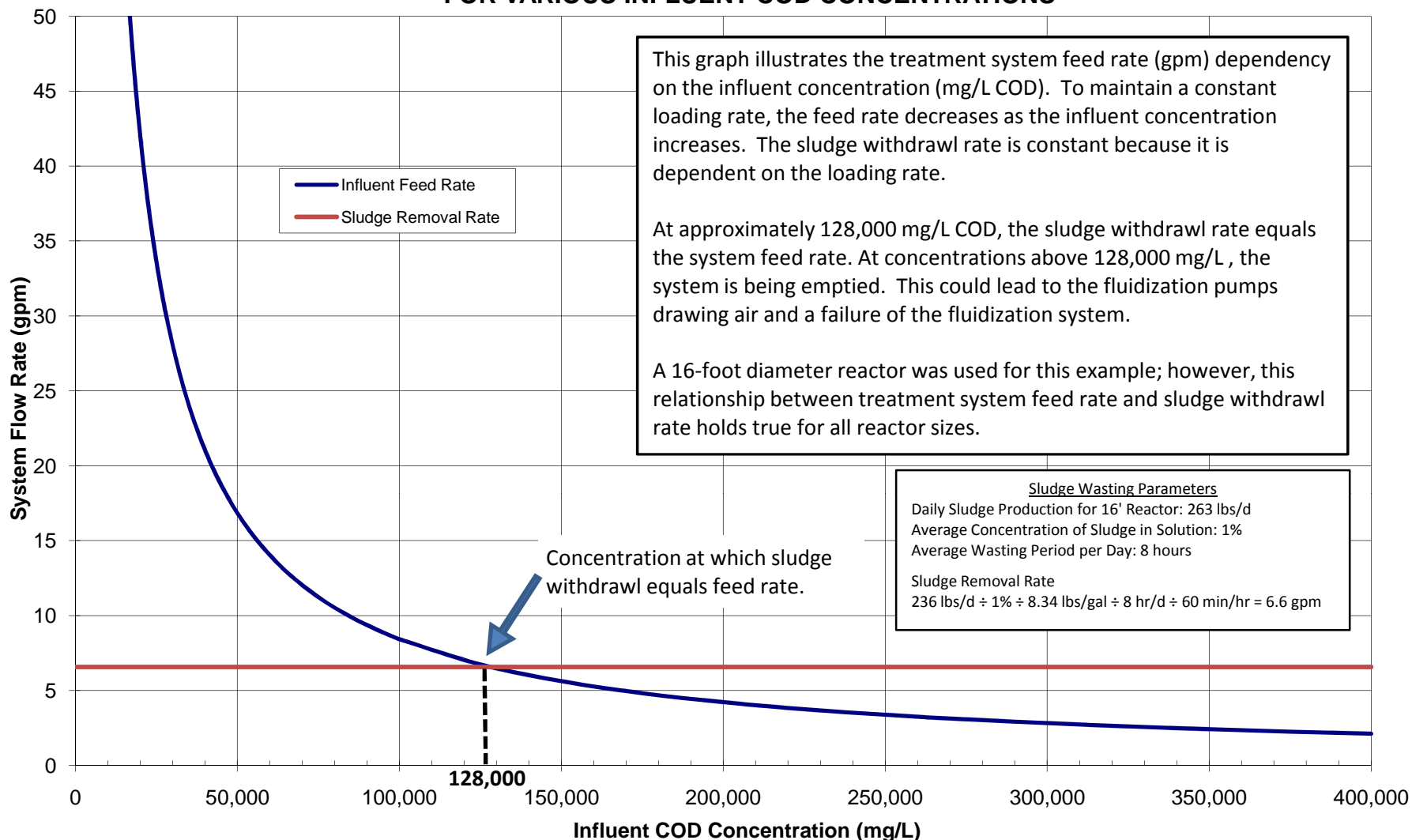
3. EPA Should Provide a Compliance Exception When an AFB System is Appropriately Operated but Still Exceeds Effluent Limits

On page 14-19 of the TDD, EPA states that one percent of daily values recorded from the model technology exceed the proposed effluent limits. EPA also acknowledges that this result is expected given the method used for determining the effluent limits. Three percent of the weekly average effluent concentrations are also expected to exceed the proposed limits given the method used for calculating those limits.

In the TDD, EPA describes sets of data from the ALB AFB treatment system that were excluded because EPA assumed that the system was not operating optimally as the model technology. This assumption may not be correct. The preceding analysis of the effects of influent COD loading on effluent COD concentrations demonstrates that a number of the high effluent concentrations were a result of situations where decisions were made to operate the AFB system closer to its capacity. In other words, the system was operating properly, yet the limits would have been exceeded. Page 14-19 of the TDD states, "EPA may contact Albany Airport to better understand these 27 values, determine whether they should be considered upsets of the treatment units, and evaluate controls that will project against these more concentrated discharges." We recommend that EPA follow up with ALB as proposed to further consider this issue.

ATTACHMENT 1

AFB SYSTEM FLOW RATE AND SLUDGE REMOVAL RATE FOR VARIOUS INFLUENT COD CONCENTRATIONS



Attachment 2

AFB Treatment System

Order of Magnitude Preliminary Opinion of Probable Cost

Scenario	CDF Collection	End-of-Pipe Collection
Treatment Capacity (lbs/day BOD)	33,000	38,000
Costs		
Site Work	\$3,800,000	\$4,400,000
Building Costs	\$3,900,000	\$4,500,000
Treatment Equipment	\$9,500,000	\$10,900,000
Laboratory Equipment	\$100,000	\$100,000
Instrumentation and Methane Control	\$700,000	\$800,000
Mechanical	\$5,300,000	\$6,000,000
Electrical, Programming, and Monitoring	\$4,100,000	\$4,700,000
Subtotal	\$27,400,000	\$31,400,000
5% Insurance, Bond & Mobilization	\$1,400,000	\$1,600,000
10% Overhead	\$2,700,000	\$3,100,000
20% Engineering	\$5,500,000	\$6,300,000
15% Profit	\$4,100,000	\$4,700,000
30% Contingency	\$12,400,000	\$14,100,000
Total	\$53,500,000	\$61,200,000

Costs Do Not Include:

- Collection System Modifications
- Storage Facilities
- Piping from CDF to Storage Facilities
- Piping from Storage Facilities to Treatment Facilities
- Piping from Treatment Facilities to Outfall Discharge Point
- Site Constraints (e.g., Utility Improvements, etc.)
- Land Availability and Lost Opportunity Cost
- Site-Specific Conditions



John A. Lengel Jr., P.E.

PRINCIPAL-IN-CHARGE
GRESHAM, SMITH AND PARTNERS

John brings to any project an exceptional amount of design, regulatory and environmental consulting experience for a variety of municipal, transportation and other private and public sector clientele. In this capacity, John is responsible for a variety of projects, including: aviation storm water and deicing issues, particularly evaluation, permitting and design of collection, storage, treatment and disposal options; airport deicing program management; environmental assessments for property transactions, NPDES storm water permitting, hazardous chemical inventory, release reporting, compliance audits and environmental management systems (EMS).

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John's experience includes deicer management design, planning, reviews of airport-wide aircraft deicing operations, SPCC planning and training, environmental investigations, construction storm water guidance manual development, compliance monitoring, air emission inventories and airside ramp design assistance.

John is committed to assisting clients by actively participating in environmental policy development and has assisted with NPDES permits and provided detailed comments for submittal to the U.S. EPA.

John has served as Principal-in-Charge for dozens of designs, surveys and assessments of deicer management facilities at airports across the U.S., including: Akron-Canton Regional; Atlantic City International; Burlington International; Charlottesville-Albemarle; Cleveland Hopkins International; Dayton International; Denver International; Indianapolis International; Kalamazoo-Battle Creek International; Pittsburgh International; Port Columbus International; Portland International; Roanoke Regional; T.F. Green Airport, Toledo Express and Westchester County, to name a few. These projects have occurred over the span of John's 20-year career with multiple firms.



Timothy P. Arendt, P.E.

PROJECT MANAGER
GRESHAM, SMITH AND PARTNERS

Tim has more than 23 years of environmental engineering experience associated with water resources issues for airports, industries and municipalities. Over the last 15 years, he has become one the nation's leading experts on evaluating and developing deicer management systems for airports. His work includes serving as Principal-in-Charge and Project Manager for several of the most comprehensive deicer management systems in the industry, including the Wilmington Airpark (1995 – present), Akron- Canton Regional (2004 – present) and Portland International (2005 – present).

EDUCATION

1993/ /Master of
Science, Environmental
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YEARS OF EXPERIENCE

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Tim's experience on deicer management system development covers the spectrum of potential activities, including regulatory negotiation, alternatives analysis, design and day-to-day operation of pilot-scale treatment systems, fate and transport modeling, field sampling, conceptual design, bid and contract document preparation, on-site construction observation, construction submittal review, coordination with contractors and construction managers, system commissioning and start-up, development of operations and maintenance manuals, staffing analysis, operator training, performance analysis and troubleshooting. Additionally, Tim has taken a leadership position in the aviation industry on environmental issues, including providing support to Airports Council International (ACI) in preparation of comments to U.S. EPA on the draft ELG proposal. Tim is also currently serving as Principal Investigator on ACRP 02-11: A Handbook for Addressing Water Resource Issues Affecting Airport Capacity Enhancement Planning, and was a key contributor to the Best Management Practices Fact Sheets on ACRP 02-02 Deicing Planning Guidelines and Practices. He has also presented papers at many industry conferences, including the last two ACI Deicer Management conferences.

SPECIFIC DEICER MANAGEMENT EXPERIENCE

Over the last 12 years, Tim has served as project manager for three of the most complex deicer management systems at U.S. airports, as noted above. Through these experiences, he recognized the unique nature of deicing systems' design and worked to establish processes in the concept development, bid document development, cost analysis, construction management, start-up and operation that focused on unique needs. His experience allows him to anticipate the issues and data needs associated with deicer management system design, resulting in a more efficient and effective design product. Tim brings a specific expertise in the treatment of deicer and fully recognizes both the benefits and challenges associated with on-site treatment as well as the importance of communicating those characteristics to the airport staff.



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**AIRCRAFT AND PASSENGER DELAY AND COSTS
RESULTING FROM CENTRALIZED AIRCRAFT DEICING
AT LOGAN INTERNATIONAL AIRPORT**

Prepared for:
Massachusetts Port Authority

Prepared by:
SH&E
an ICF International Company

February 24, 2010

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1

INTRODUCTION AND SUMMARY OF RESULTS

1.1 INTRODUCTION AND BACKGROUND

In August 2009, the Environmental Protection Agency issued a proposed rule, *Effluent Limitation Guidelines and New Source Performance Standards for the Airport Deicing Category*, which would govern the discharge of deicing substances at airports like Logan International Airport. The only way the Massachusetts Port Authority (Massport) could comply with the proposed rule would be to collect and treat spent aircraft deicing and anti-icing fluids through the use of a centralized deicing pad (CDF). At Logan Airport this would require the relocation of aircraft deicing operations from the gate and ramp areas, where nearly all deicing activity occurs currently, to a centralized deicing facility.

Massport and its consultants have determined that the only feasible location for a CDF would be at Pad Juliet on the southwest side of the airport, where a limited amount of aircraft deicing currently takes place. An expanded Pad Juliet has been designed to accommodate up to nine aircraft and is configured with seven positions sized for Group II/III aircraft or smaller and two positions sized for Group IV/V aircraft or smaller.

The proposed rule would require all aircraft that need to be deiced and/or anti-iced to taxi from the gate areas to Pad Juliet and then from Pad Juliet to the departure runway ends. In doing so, all aircraft would incur additional taxi time above current conditions, in which aircraft are deiced at the gate and then taxi directly to the departure runway. In addition, during busy departure periods, aircraft would incur queuing delays waiting to be deiced at Pad Juliet. SH&E was asked by Massport to estimate the additional taxi times and aircraft queuing delays that would occur with deicing at Pad Juliet and to estimate the associated costs to airlines and passengers.

SH&E calculated the delays associated with use of Pad Juliet by performing a comparative analysis of existing taxi times from the gate and ramp areas to the departure runway ends and the total taxi times that would be involved with the use of a single, centralized deicing facility (CDF) at Pad Juliet. Specific analyses performed by SH&E include the following:

- An analysis of the number of aircraft deiced at Logan International Airport during the 2008/2009 season¹ by day and the weather conditions when deicing took place. This analysis determined the number of aircraft that would incur additional taxi time and the number of aircraft that would incur delays due to congestion or queuing at Pad Juliet.
- An analysis of changes in aircraft taxi distances and taxi times from the gate areas to the departure runway ends that would result from relocating deicing activities from the terminal areas to the CDF.
- An estimate of queuing delays that would be incurred at Pad Juliet during times when aircraft demand exceeds the capacity of the Pad.
- An estimate of the cost of additional taxi times and aircraft queuing to the airlines, in terms of aircraft operating costs, and to passengers, in terms of the value of time.

The analysis was conducted using current winter airline flight schedules at Logan Airport to establish a base year estimate for the 2009/2010 deicing season (“2010”). The results for the base year were then extrapolated to the 2019/2020 deicing season (“2020”) to represent the future impacts of deicing at the CDF.

The actual hourly throughput of Pad Juliet may vary for a number of reasons including the severity of the deicing conditions, the amount of time needed to apply deicing/anti-icing fluids, and the mix and sequencing of aircraft that need to be deiced at a particular time. Because of the variability and uncertainty associated with the throughput rate of Pad Juliet, queuing delays were modeled using two throughput rates. Hence all delay and cost estimates are provided for a Low and a High case, which vary solely because of differing assumptions regarding the throughput of Pad Juliet.

The following section summarizes the taxi time and queuing delays associated with the use of Pad Juliet and the costs of those delays to airlines and passengers. The subsequent chapters describe the analytical approach, major assumptions and the data used to produce the estimates of overall delays to airlines and their passengers, and the associated costs of delays that would be incurred with the centralization of deicing operations.

¹ Deicing at Logan Airport typically begins in October and ends the beginning of April. For the analysis in this report, the deicing season was defined as October 1 to March 31.

1.2 SUMMARY OF RESULTS

The key findings of our analysis are as follows:

- During the approximately 112 days of deicing at Boston-Logan per year, the Proposed Rule would cause an average additional delay for every aircraft deiced of between 10 and 25 minutes. In ten years, this additional delay per aircraft would jump to approximately 16 to 44 minutes.
- During the approximately 27 days per year with moderate deicing conditions, the Proposed Rule would cause an average additional delay for every aircraft deiced of between 14 and 43 minutes. By the year 2020, this additional delay would balloon to approximately 24 to 78 minutes per deiced aircraft – far above the 15-minute delay threshold set by the FAA.
- The total cost of these delays over the next ten years would be between \$65 million and \$167 million.

This chapter briefly summarizes the methodology used to arrive at these findings; the findings and methodology are described in more detail in the subsequent chapters.

1.2.1 Taxiing and Queuing Delays for Deicing at Pad Juliet

There are two sources of incremental time or delay associated with the centralization of aircraft deicing at Logan Airport. First, all aircraft that need the application of deicing or anti-icing fluids will incur additional taxi time as they taxi from the gate and ramp areas to Pad Juliet in the southwest corner of the airfield and then from the pad to the departure runway end. Second, in certain conditions, aircraft would experience delays as a result of queuing at the Pad. These two sources of incremental time represent the total delays that would be incurred as a result of deicing at Pad Juliet versus the current practices of deicing at the terminal gates and ramp areas.

Delays due to additional taxi times, which are constant in both the Low and High Cases (because deicing pad throughput rates were assumed not to affect taxi time), are estimated at 679 hours in 2010 and 793 hours in 2010. (See Exhibit 1-1) The increase in total taxi times from 2010 to 2020 is a function of the forecast growth in aircraft operations between 2010 and 2020. Based on data collected from the airlines on the number of aircraft deiced during the 2008/2009 season, it was estimated that approximately 6,200 aircraft would require deicing in the 2010 base year. With forecast growth in aircraft operations, it was estimated that approximately 7,250 aircraft would require deicing at Pad Juliet in 2020. Both estimates reflect the

weather patterns for the 2008/2009 winter season, during which there were 112 days on which deicing was required.

On average, deicing at Pad Juliet will increase taxi times for each aircraft by 6.6 minutes. Taxi times for widebody and general aviation (GA) aircraft, which primarily depart from the north side of the airport, would increase the most, by approximately 9 minutes.

Exhibit 1-1: Incremental Taxi Time Delays Associated with the Use of Pad Juliet for Deicing at Logan Airport – Base Case and Forecast

Segment	Aircraft Class	Base Year 2010		Forecast 2020		Avg. per Aircraft (Mins)
		Total Aircraft De-iced	Incremental Taxi Time (Hrs)	Total Aircraft De-iced	Incremental Taxi Time (Hrs)	
Sched Psgr	RJ/Turboprop	2,060	206.0	2,410	241.0	6.0
Sched Psgr	Narrowbody	3,231	344.6	3,781	403.3	6.4
Sched Psgr	Widebody	606	87.9	709	102.8	8.7
Cargo	Widebody	121	12.5	142	14.7	6.2
GA	Business Jet	175	26.8	205	31.4	9.2
Total/Avg		6,193	677.8	7,247	793.2	6.6

Source: SH&E analysis

While all deiced aircraft would incur additional taxi time because of the longer distances traveled with the use of Pad Juliet, only a portion of deiced aircraft would be subject to congestion and queuing delays at the pad. Based on data analysis and discussions with Massport Aviation Operations staff, we predict that queuing delays would only occur during “moderate deicing” weather conditions, as explained below. (Please note that the definitions of “light,” “moderate,” and “heavy” deicing used in this study were for the purposes of this study only, and may not correspond with the use of those terms by Massport or other consultants.)

During times of “light deicing” activity, when there is no freezing snow or precipitation, but some aircraft require deicing because of frost conditions, the number of aircraft that need to be deiced is low and is not likely to result in delays at Pad Juliet. There were 78 “light deicing” days in 2008-2009.

During “heavy deicing” conditions, defined as very heavy snowstorms with 4 or more inches of accumulation in a day, the number of aircraft that need to be deiced

may also be low relative to scheduled aircraft demand because of airline flight cancellations. Also, during very heavy snow events, aircraft are more likely to incur delays as a result of runway closures for snow removal operations or weather conditions. As a result, no queuing delays are forecast at pad Juliet under these conditions. There were 7 “heavy deicing” days in 2008-2009.

On “moderate deicing” days, defined as days with freezing rain or light snow (less than 4 inches of accumulation throughout a day), there are likely to be relatively few flight cancellations and large numbers of aircraft that require deicing. On many of these moderate deicing days, freezing rain or snow occurs overnight, which requires all RON (remain overnight) aircraft to be deiced before departure the following morning. There were 27 “moderate deicing” days in 2008-2009.

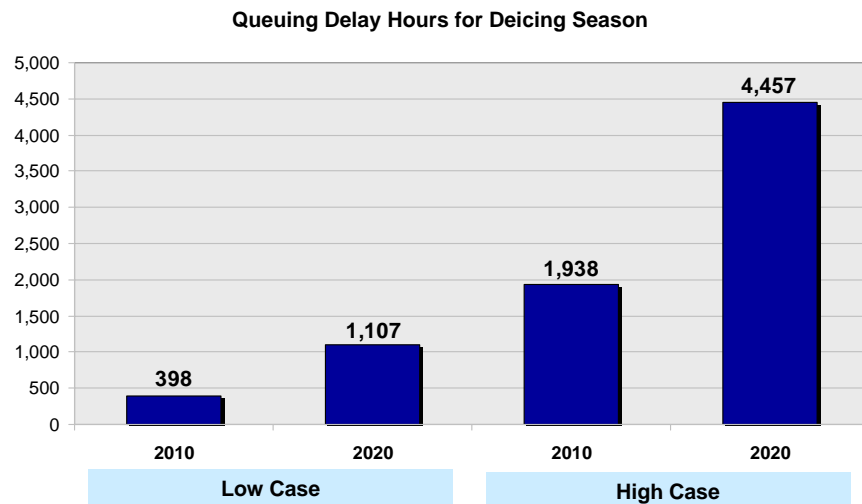
Thus, moderate deicing days would cause queuing delays at pad Juliet. Based on the number of aircraft deiced during the 2008/2009 season and corresponding weather data, it was estimated that approximately 3,200 aircraft would require deicing on the 27 moderate deicing days and would incur queuing delays at Pad Juliet in 2010. The number of aircraft deiced on these moderate deicing days represents 51 percent of all aircraft deiced at Logan during the deicing season. Accounting for growth in aircraft operations over the forecast period, the number of aircraft that would require deicing on moderate deicing days in 2020 was estimated at 3,730.

Queuing delays for the aircraft using Pad Juliet during moderate deicing conditions vary for the Low and High Cases because of different assumptions regarding aircraft throughput at Pad Juliet. In the Low Case, which assumes that 36 aircraft can be deiced at pad Juliet in an hour, queuing delays are estimated at 398 hours in 2010 and 1,107 hours in 2020. The High Case assumes that Pad Juliet’s hourly throughput is 27 aircraft. As a result of the lower throughput, the queuing delays in the High Case increase to 1,938 hours in 2010 and 4,457 hours in 2020. (See Exhibit 1-2)

Exhibit 1-3 summarizes the average queuing time per aircraft for those aircraft on moderate deicing days that would experience queuing delays waiting to be deiced at Pad Juliet. The average queuing time per aircraft in the 2010 base year ranges from 7.5 minutes in the Low Case to 36.5 minutes in the High Case. For the forecast year, the average delay per aircraft ranges from 17.8 minutes to 71.7 minutes. The FAA requires reporting of air traffic delays of 15 minutes or more.²

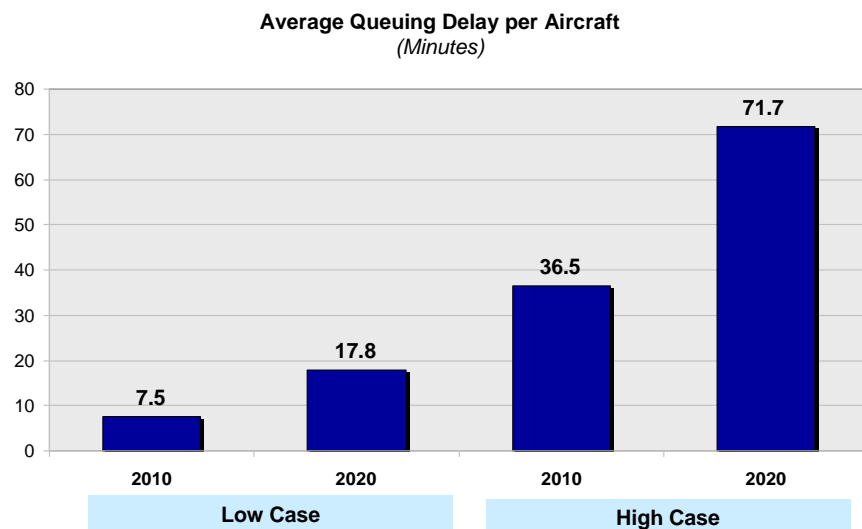
²http://www.bts.gov/programs/statistical_policy_and_research/source_and_accuracy_compendium/air_traffic_delay.html

Exhibit 1-2: Queuing Delays Associated with the Use of Pad Juliet for Deicing at Logan Airport – Base Case and Forecast



Source: SH&E analysis

Exhibit 1-3: Average Queuing Delays Associated with the Use of Pad Juliet for Deicing at Logan Airport – Base Case and Forecast

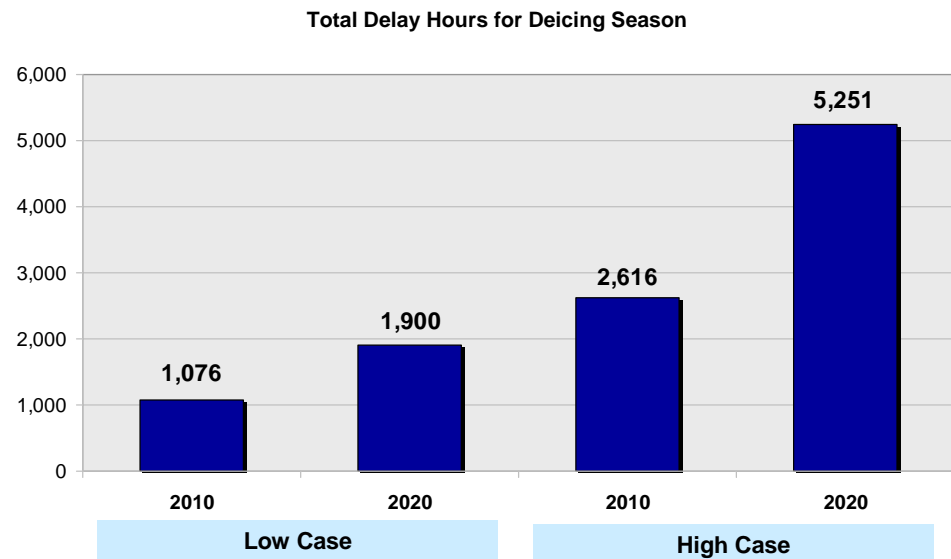


Note: Queuing delays only occur on moderate deicing days and affect 51 percent of the aircraft deiced at Logan.

Source: SH&E analysis

Thus, in 2010, the estimated total delays for deicing operations at the CDF (including both queuing and taxiing delays) are 1,076 hours in the Low Case and 2,616 hours in the High Case. (See Exhibit 1-4) In the 2020 forecast year, delays are estimated at 1,900 hours in the Low Case and 5,251 hours in the High Case. Scheduled passenger airlines are estimated to incur 95 percent of the delays associated with the use of Pad Juliet.

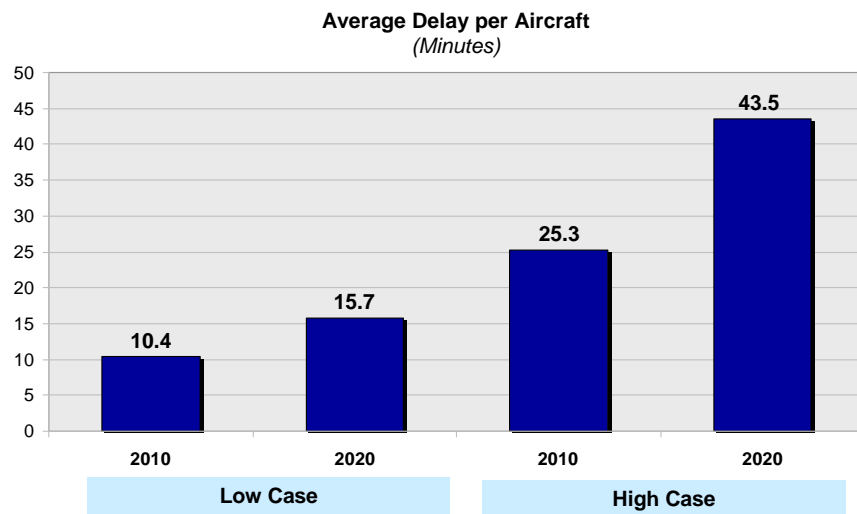
Exhibit 1-4: Estimated Incremental Delays Associated with the Use of Pad Juliet for Deicing at Logan Airport – Base Case and Forecast



Source: SH&E analysis

Exhibit 1-5 shows the average minutes of additional time per aircraft for all aircraft deiced at Pad Juliet over the deicing season. The average delay per aircraft in the base year ranges from 10.4 minutes in the Low Case to 25.3 minutes in the High Case. For the forecast year, the average delay per aircraft ranges from 15.7 minutes to 43.5 minutes.

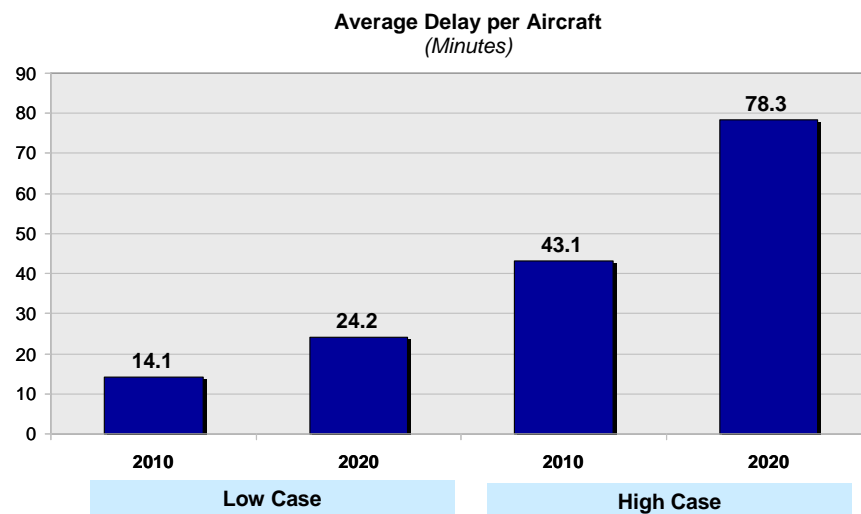
**Exhibit 1-5: Average Delay per Aircraft for Deicing at Pad Juliet
– Base Case and Forecast**



Source: SH&E analysis

On the 27 days per year with moderate deicing conditions, aircraft would incur queuing delays while waiting to be deiced at pad Juliet in addition to the added taxi times incurred. In 2010, the total average delay per aircraft on these moderate deicing days is between 14 and 43 minutes. By the year 2020, the total average delay would increase to approximately 24 to 78 minutes per deiced aircraft – far above the 15-minute delay threshold set by the FAA.

Exhibit 1-6: Average Delay per Aircraft for Deicing at Pad Juliet on Moderate Deicing Days – Base Case and Forecast



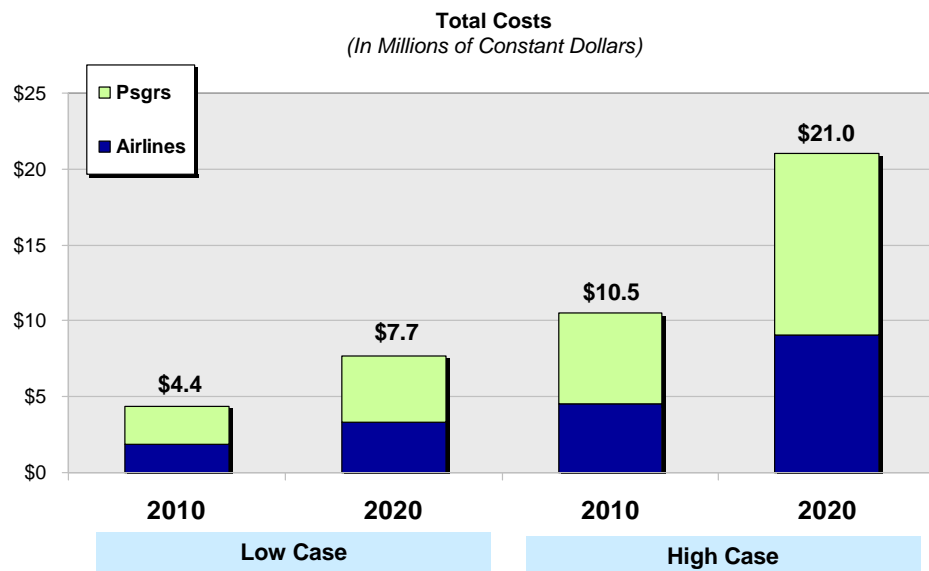
Source: SH&E analysis.

1.2.2 Costs of Incremental Taxiing and Queuing Times for Deicing at Pad Juliet

The increased time required for deicing at Pad Juliet, whether for taxiing or for queuing at the pad, results in additional costs to airlines and air passengers. Airlines and general aviation operators would incur added aircraft operating costs and passengers would lose productivity due to the longer times required to complete their travel. Aircraft costs that result from delays associated with Pad Juliet were estimated based on representative aircraft types in the Logan fleet mix and reported airline and general aviation aircraft operating costs per block hour. The costs incurred by passengers aboard the delayed aircraft were estimated using the FAA recommended values of time for airline and general aviation passengers.

In the Low Case, which assumes a throughput of 36 aircraft per hour, the total cost of delays associated with deicing at Pad Juliet is \$4.4 million in 2010 and \$7.7 million in 2020.³ In the High Case, which assumes a lower hourly throughput of 27 aircraft, the total cost of delays ranges from \$10.5 million in 2010 to \$21.0 million in 2020. (See Exhibit 1-7)

Exhibit 1-7: Total Cost of Delays Associated with the Use of Pad Juliet for Deicing at Logan Airport – Base Case and Forecast



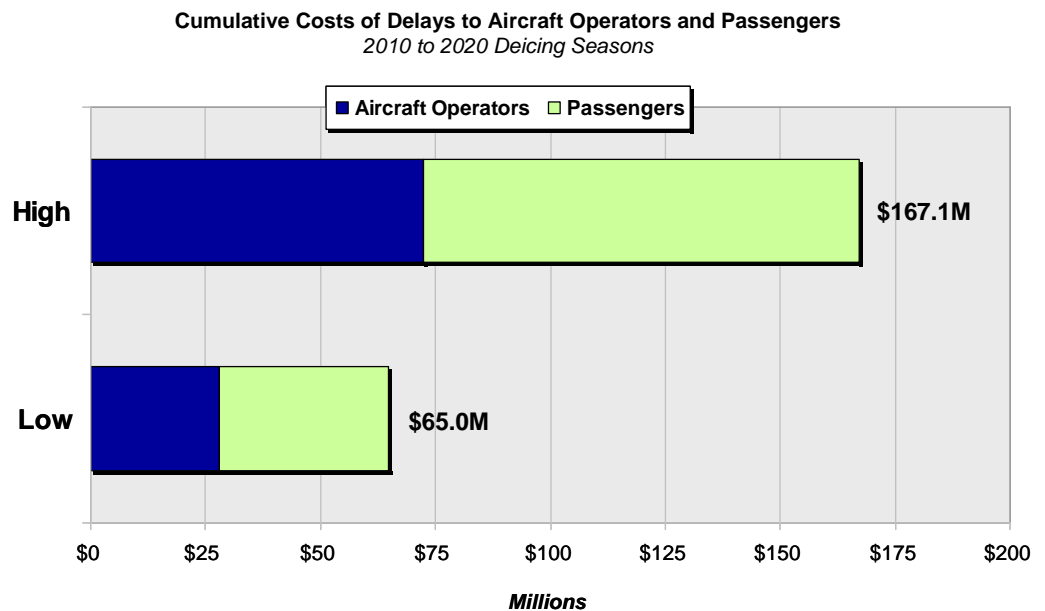
Source: SH&E analysis

³ Cost estimates for 2020 do not include an adjustment for inflation.

The total cost of delays to airlines in the Low Case is estimated at \$1.9 million in 2010 and \$3.3 million in 2020. Airline costs in the High Case are estimated at \$4.5 million in 2010 and \$9.1 million in 2020. Airline costs increase over the forecast period faster than the growth in aircraft operations because queuing delays will increase exponentially as the level of flight demand approaches and exceeds the throughput capacity of the CDF.

In the Low Case, total passenger costs related to the use of Pad Juliet are estimated at \$2.5 million in 2010 and \$4.4 million in 2020. Under the High Case assumptions, passenger costs increase to \$6.0 million in 2010 and \$11.9 million in 2020.

Exhibit 1-8: 10-year Cumulative Costs of Delays from Centralized Deicing Operations at Logan Airport



Note: In constant dollars

Source: SH&E analysis.

Over a 10-year period, the cumulative cost of delays to aircraft operators and passengers is estimated at between \$65.0 million and \$167.1 million. The cumulative cost to aircraft operators ranges from \$28.1 million in the Low Case to \$72.4 million in the High Case. The cumulative cost incurred by passengers on delayed aircraft is forecast at \$36.8 million to \$94.7 million.

2

ESTIMATION OF AIRCRAFT DELAYS

2.1 OVERVIEW OF ANALYTICAL APPROACH

SH&E estimated the delays that aircraft would incur if deicing operations were relocated from the terminal and ramp areas to Pad Juliet. The major steps and data sources relied on in the analysis are summarized below.

Step 1: Analyze Aircraft Deicing Conditions at Logan

SH&E relied on data collected by Massport during the 2008-2009 deicing season and weather observations for the same period to determine the frequency, duration and timing, and intensity of aircraft deicing at Logan Airport. Data compiled from daily airline and FBO logs of deicing/anti-icing fluid volumes during 2008/2009 provided information on the number of aircraft deiced each day. An analysis of these data and the corresponding hourly weather data indicated the duration and intensity of deicing events at Logan Airport during a typical winter season. These data were used to estimate the number of aircraft deiced and the number of aircraft subject to queuing delays as described in the following section.

Step 2: Analyze Additional Taxi Time Required for Deicing at Pad Juliet

To estimate the impact of centralized deicing operations on aircraft taxi times at Logan, SH&E calculated the additional taxi time that would be incurred from the terminal areas to each runway end if all aircraft were deiced at Pad Juliet. SH&E relied on daily scheduled airline departures from the January 2010 Official Airline Guide (OAG) and estimates of daily all-cargo and general aviation (GA) operations to determine the number of aircraft originating from each terminal area and the mix of aircraft types (i.e., widebody, narrowbody, small regional jet/non-jet) at each terminal. Taxi times were calculated from:

- a) the terminal areas to the departure runway ends;
- b) the terminal areas to Pad Juliet; and
- c) Pad Juliet to the runway ends.

The incremental taxi times to each runway end (*i.e.*, $b + c - a$) were then weighted by actual runway usage for the 2008/2009 deicing season to determine the average

additional taxi time per aircraft. The average additional taxi time per aircraft was then multiplied by the total number of aircraft deiced in the base and forecast years to estimate total additional taxi time.

Step 3: Estimate Queuing Delays that May Be Incurred at Pad Juliet

From the analysis in Step 1, it was determined that during moderate deicing conditions, large numbers of aircraft would require deicing across a compressed period of time, leading to delays waiting to be deiced and/or anti-iced at Pad Juliet. A queuing model was used to determine the average wait time per aircraft on these moderate deicing days. Because the time required to deice aircraft can vary significantly depending upon weather conditions and time specific fleet mix, Massport and CH2M Hill provided two alternative hourly aircraft throughput rates for the expanded Pad Juliet - 27 aircraft per hour and 36 aircraft per hour. The average queuing delays per aircraft were then multiplied by the number of aircraft deiced on moderate deicing days for the base year and the forecast year to estimate the range of expected aircraft queuing delays at Pad Juliet.

2.2 FREQUENCY OF DEICING CONDITIONS AT LOGAN AIRPORT

The deicing database that was compiled from daily logs provided by the airlines and FBOs from October 1, 2008 to March 31, 2009 included data on the number of aircraft deiced each day during the season. However, the data submitted by several airlines was incomplete. To adjust the data for underreporting, data for airlines that fully reported (i.e., Continental, Delta, jetBlue and Northwest) were scaled up based on their percentage of total scheduled airline flights in January 2009. A second adjustment was made to account for cargo and general aviation aircraft using Massport's operations statistics for all-cargo and general aviation operations during the 2008/2009 de-icing season. All-cargo and general aviation accounted for less than 6 percent of total aircraft demand during the 2008/2009 deicing season.

Exhibit 2-1 presents the estimated number of aircraft deiced during the 2008/2009 season. The reported number of aircraft deiced at Logan was 3,369. The expanded number of aircraft deiced, which accounts for underreporting, is 6,193.

Exhibit 2-2 summarizes the number of aircraft deiced by month. December and January accounted for approximately 60 percent of the aircraft deiced at Logan during the 2008/2009 season.

Exhibit 2-1: Estimated Number of Aircraft Deiced at Logan Airport During the 2008/2009 Deicing Season

Description	Note	Amount
Total Reported Number of Aircraft Deiced	\1	3,369
Reported Aircraft Deiced by CO/DL/B6/NW	\1	2,243
CO/DL/B6/NW Departures as a Percent of Total Scheduled Airline Departures	\2	38.3%
Estimated Total Aircraft Deiced by Passenger Airlines	\3	5,852
Passenger Airline Operations as a Percent of Total Logan Operations	\4	94.5%
Estimated Total Aircraft Deiced	\5	6,193

Notes:

\1 Massport, 2008/2009 Deicing Database (October 2008-March 2009)

\2 OAG, January 2009

\3 Reported aircraft deiced by CO/DL/B6/NW divided by 38.3%

\4 Massport Statistics for December 2008-March 2009.

\5 Estimated aircraft deiced by passenger airlines divided by 94.5%

Exhibit 2-2: Estimated Number of Aircraft Deiced by Month – 2008/2009 Deicing Season

Month	No. of Aircraft Deiced	Percent of Total
October	88	1.4%
November	278	4.5%
December	1,662	26.8%
January	2,044	33.0%
February	1,039	16.8%
March	<u>1,083</u>	<u>17.5%</u>
Total	6,193	100.0%

Source: Massport Deicing Database, adjusted for underreporting

The adjusted database of daily aircraft de-iced was then correlated to hourly weather observations for the 2008/2009 deicing season. By correlating the number of aircraft deiced on each day to weather observations on those days, SH&E identified three patterns of deicing conditions that occur at Logan Airport, which we defined as follows solely for the purpose of this study:

- **Light deicing** - occurs when there is no freezing snow or precipitation, but some aircraft require deicing because of frost conditions.
- **Moderate deicing** – occurs on days with freezing temperatures (32 degrees or lower) and rain or light snow (less than 4 inches of accumulation throughout a day).
- **Heavy deicing** – occurs on days when snow accumulation is 4 inches or greater.

The significance of the types of deicing conditions relates to the probability of aircraft queuing delays at Pad Juliet. During light deicing conditions, the number of aircraft that need to be deiced is relatively low. As shown in Exhibit 2-3, an average of 19 aircraft per day were deiced under light deicing conditions when aircraft requiring defrosting. Deicing under these conditions is not forecast to result in aircraft queues at Pad Juliet.

Exhibit 2-3: Number of Aircraft Deiced at Logan by Type of Deicing Condition – 2008/2009 Deicing Season

Weather Category	Number of Days in Cat.	Number of Acft De-Iced	Avg Num of Acft De-Iced Per Day
Light defrost Days	78	1,475	19
Moderate De-Icing Days	27	3,186	118
Heavy Snow Days	7	1,532	219
Total	112	6,193	55

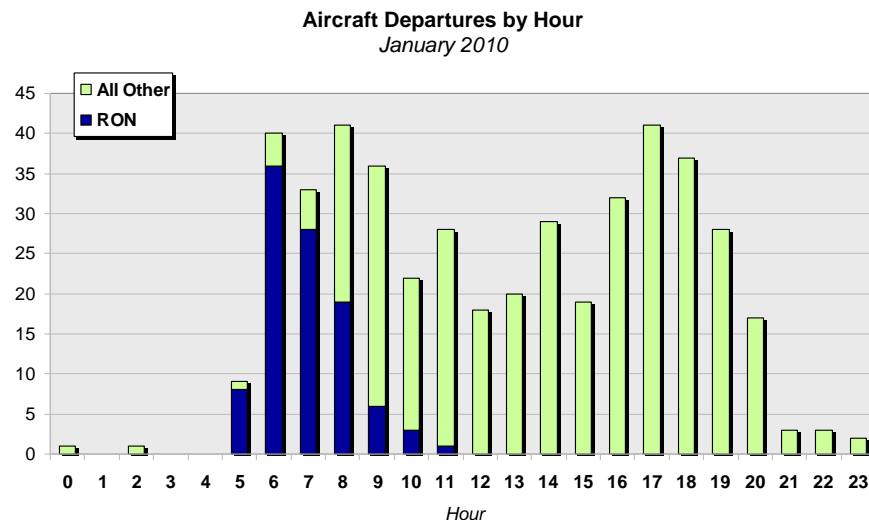
Source: Massport Deicing Database, adjusted for underreporting and hourly weather observations for October 1, 2008 to March 31, 2009.

During “heavy deicing” conditions, defined as very heavy snowstorms of long duration with 4 or more inches of accumulation in a day, the number of aircraft that need to be deiced may also be low relative to scheduled aircraft demand because of airline flight cancellations. Also, during very heavy snow events, aircraft are more likely to incur delays as a result of runway closures for snow removal operations or weather conditions. In total, 1,532 aircraft were deiced on heavy snow days during

the 2008/2009 season. While the average number deiced per day was 219, snowfall and deicing conditions occurred on average for 14 hours of the day, resulting in an average of 16 aircraft deiced per hour. As with light deicing conditions, the relatively low number of aircraft per hour that require deicing under heavy deicing conditions is not expected to result in queuing delays at the pad.

On moderate deicing days, there are relatively few flight cancellations and large numbers of aircraft that require deicing over consecutive hours. On 18 of the 27 moderate deicing days identified, freezing rain or snow occurred overnight, which requires all RON (remain overnight) aircraft to be deiced before departure the following morning. An analysis of airline schedules for January 2010 indicates that 101 passenger airline aircraft are RON aircraft at Logan Airport. These aircraft depart between 5:00 am and 11:00 am, with 82 percent departing between 6:00 am and 8:00 am, which corresponds with the peak morning departure bank at Logan. (See Exhibit 2-4) Because significant numbers of aircraft would need to be deiced over a small number of hours on moderate deicing days, aircraft deiced on these moderate deicing days would incur queuing delays due to capacity limitations at Pad Juliet.

Exhibit 2-4: Aircraft Departures by Hour at Logan Airport – January 2010



Source: OAG, January 2010 for scheduled passenger airlines and SH&E estimates for cargo and GA departures.

Based on the number of aircraft deiced during the 2008/2009 season and corresponding weather data, it was estimated that approximately 3,200 aircraft would require deicing on moderate deicing days in 2010. Many of these aircraft would experience queuing delays waiting to be deiced at Pad Juliet.

2.3 ESTIMATION OF INCREMENTAL TAXI TIMES

Several steps were involved in estimating the total incremental taxi time attributable to shifting the location of deicing operations from the terminals to Pad Juliet.

2.3.1 Demand by Terminal and Aircraft Type

The first step in the taxi time analysis was to determine daily aircraft departures at Logan for the winter 2009/2010 season by terminal location. SH&E used January 2010 airline schedules from the OAG and current airline locations at Logan Airport to map daily scheduled passenger aircraft departures by major aircraft type to each of the terminals at Logan Airport. (See Appendix A for airline terminal locations.) In January 2010 there were 438 scheduled daily departures by passenger airlines spread across Terminals A, B, C and E at Logan Airport.

Daily all-cargo and GA aircraft departures were estimated for the 2009/2010 season based on actual Logan operations data (see Exhibit 2-5). Cargo activity was estimated at 9 operations per day based on actual Logan cargo operations for October 2009 to December 2009. Cargo departures were split between the North and South cargo areas based on the number of Fedex and UPS operations at Logan reported in the US DOT, T-100 Database for the 12 months ending October 2009. Fedex operates from the south side of the airfield and UPS operates from the north side. Together, Fedex and UPS accounted for 83 percent of total cargo operations at Logan for the YE October 2009.

GA activity was estimated based on the average GA departures that occurred at Logan during December 2009. All of the GA aircraft were assumed to depart from the GA area on the north side of the airfield.

Exhibit 2-5: Daily Aircraft Departures by Airport Location and Aircraft Type

Airport Location	Aircraft Type	Daily Aircraft Departures
Terminal A	WB	1
Terminal A	NB	59
Terminal A	RJ/T	32
Terminal B - East	WB	0
Terminal B - East	NB	62
Terminal B - East	RJ/T	47
Terminal B - West	WB	3
Terminal B - West	NB	38
Terminal B - West	RJ/T	31
Terminal C - Pier C	WB	0
Terminal C - Pier C	NB	74
Terminal C - Pier C	RJ/T	35
Terminal C - Pier B	WB	0
Terminal C - Pier B	NB	22
Terminal C - Pier B	RJ/T	4
Terminal E	WB	11
Terminal E	NB	15
Terminal E	RJ/T	4
North Cargo	WB	2
South Cargo	WB	7
GA Apron	Biz Jet	13
Total		460

WB - widebody
NB - narrowbody
RJ/T - regional jet/turboprop or piston
Biz jet - business jet

Source: OAG, January 2010 and SH&E analysis.

2.3.2 Incremental Taxi Distance and Times

CH2M Hill provided taxi distances from a) the terminal areas to each runway end; b) the terminal areas to Pad Juliet; and c) Pad Juliet to each runway end. Exhibit 2-6 summarizes the taxi distances as well as the additional distance traveled when using Pad Juliet and the additional taxi time incurred. The taxi time analysis assumes an average taxi speed of 10 knots per hour. As shown in the table, aircraft originating from the north side of the airfield and departing from north/northwest runways would incur the most additional taxi time when using Pad Juliet. For example, international flights originating at Terminal E and departing from 15R would be subject to an

additional 19.6 minutes of taxi time, a 10 fold increase over the time it would take to taxi directly from Terminal E to Runway 15R.

Exhibit 2-6: Taxi Distances from Terminal Areas to Pad Juliet and Runway Ends and Additional Times for Taxiing to and from Pad Juliet

Taxi Distance (feet)

	Terminal A / Terminal B West Side	Terminal B East Side	Terminal C Pier C	Terminal C Pier B	Terminal E	North Cargo Area	South Cargo Area	General Aviation Apron	Pad Juliet
Pad Juliet	5,100	3,950	5,000	6,150	9,500	10,400	4,000	9,500	-
Runway 9	4,600	3,500	4,600	5,650	8,850	9,800	3,500	8,950	3,900
Runway 33L	12,400	8,200	7,800	8,900	12,100	13,000	10,600	12,100	12,100
Runway 4L	3,650	2,650	3,700	4,800	8,000	8,900	2,500	8,000	4,900
Runway 4R	6,600	5,650	6,750	7,800	11,000	11,900	5,600	11,000	4,650
Runway 22L	12,750	8,950	8,450	6,850	10,700	11,800	11,950	10,200	13,300
Runway 22R	13,250	9,450	8,950	7,350	11,200	12,300	10,450	10,700	12,700
Runway 27	12,800	9,000	8,700	9,800	13,050	13,950	11,450	13,050	12,900
Runway 15R	9,300	5,800	5,300	4,050	1,950	2,800	8,850	1,450	12,200

Additional Taxi Distance Per Departure (feet)

	Terminal A / Terminal B West Side	Terminal B East Side	Terminal C Pier C	Terminal C Pier B	Terminal E	North Cargo Area	South Cargo Area	General Aviation Apron
Runway 9	4,400	4,350	4,300	4,400	4,550	4,500	4,400	4,450
Runway 33L	4,800	7,850	9,300	9,350	9,500	9,500	5,500	9,500
Runway 4L	6,350	6,200	6,200	6,250	6,400	6,400	6,400	6,400
Runway 4R	3,150	2,950	2,900	3,000	3,150	3,150	3,050	3,150
Runway 22L	5,650	8,300	9,850	12,600	12,100	11,900	5,350	12,600
Runway 22R	4,550	7,200	8,750	11,500	11,000	10,800	6,250	11,500
Runway 27	5,200	7,850	9,200	9,250	9,350	9,350	5,450	9,350
Runway 15R	8,000	10,350	11,900	14,300	19,750	19,800	7,350	20,250

Additional Taxi Time Per Departure (minutes)

	Terminal A / Terminal B West Side	Terminal B East Side	Terminal C Pier C	Terminal C Pier B	Terminal E	North Cargo Area	South Cargo Area	General Aviation Apron
Runway 9	4.3	4.3	4.2	4.3	4.5	4.4	4.3	4.4
Runway 33L	4.7	7.8	9.2	9.2	9.4	9.4	5.4	9.4
Runway 4L	6.3	6.1	6.1	6.2	6.3	6.3	6.3	6.3
Runway 4R	3.1	2.9	2.9	3.0	3.1	3.1	3.0	3.1
Runway 22L	5.6	8.2	9.7	12.4	11.9	11.8	5.3	12.4
Runway 22R	4.5	7.1	8.6	11.4	10.9	10.7	6.2	11.4
Runway 27	5.1	7.8	9.1	9.1	9.2	9.2	5.4	9.2
Runway 15R	7.9	10.2	11.8	14.1	19.5	19.6	7.3	20.0

Note: Taxi times assume an average speed of 10 knots per hour.

Source: CH2M Hill.

2.3.3 Estimation of Incremental Taxi Times Incurred by Airlines at Logan Airport

The total additional taxi time that airlines will incur at Logan Airport if deicing is moved to Pad Juliet is a function of the distribution of flights across the terminals, the aircraft fleet mix by terminal, and runway usage. To reflect Logan's actual aircraft fleet mix and runway usage during the winter season, SH&E modeled Logan's daily

departures to each runway end on an hourly basis to estimate the average additional time incurred per aircraft to each runway end. These estimates were then weighted by actual departure runway usage for the December 2008 to March 2009⁴ period to estimate the average additional taxi time incurred by aircraft using Pad Juliet for deicing. The average additional taxi time was then multiplied by the total number of aircraft deiced in the base year and the forecast year to estimate total additional taxi time.

Exhibit 2-7 summarizes the departure runway usage at Logan Airport from December 2008 to March 2009. Runway 22R on the north side of the airfield and Runway 33L on the east side are the two most frequently used runways for departures during the winter season. Together Runways 22R and 33L accounted for nearly 60 percent of all aircraft departures from December 2008 to March 2009.

Exhibit 2-7: Logan Airport Departures by Runway End

Runway	Departures by Runway End ¹	
	Actual ²	Modeled ³
22R	34.4%	41.1%
33L	25.3%	30.2%
9	19.2%	19.2%
27	11.8%	0.0%
4R	4.0%	4.0%
15R	2.3%	2.3%
4L	1.5%	1.5%
22L	1.4%	1.6%
14	0.1%	0.0%
33R	0.0%	0.0%
32	0.0%	0.0%
15L	0.0%	0.0%

¹ Widebodies are only capable of departing on Runways 15R, 33L, 4R and 22L.

² Massport Data, December 2008 to March 2009.

³ Runway 27 cannot be used when deicing is performed at Pad Juliet.

Source: Massport

Because Pad Juliet is located in an area of the airfield that encompasses a runway safety area for Runway 14/32 and critical FAA airspace surfaces for Runway 9/27, Pad Juliet can not be used when these runways are active. The taxi time assumes that no aircraft can depart from Runway 27, which accounted for nearly 12 percent of

⁴ The December 2008 to March 2009 period accounts for 98 percent of the total aircraft deiced at Logan from October 2008 to March 2009.

departures in the 2008/2009 winter season, or Runway 14 when aircraft are de-iced at Pad Juliet. If Runway 27 can not be used for departures, aircraft would instead use Runways 22R or 33L, weather permitting. The adjusted runway usage, which accounts for the unavailability of Runways 27 and 14, was used in the taxi time analysis, and is also shown in Exhibit 2-7.

The average incremental taxi times by aircraft category and runway end are summarized in Exhibit 2-8. Incremental taxi times incurred with deicing at Pad Juliet range from 6.0 minutes for regional jet and turboprop/piston aircraft from the passenger terminals to 9.1 minutes for GA aircraft from the GA apron area. Scheduled passenger narrow body jets, which account for 52 percent of Logan's daily departures in January 2010, are subject to an additional 6.4 minutes of taxi time.

Exhibit 2-8: Estimated Average Incremental Taxi Times by Aircraft Category and Runway End

Runway	Runway Usage	Average Additional Taxi Time per Aircraft (min)				
		Sched. Psgr			Cargo	GA Jet
		WB	NB	RJ/T		
22R	41.1%	-	6.9	6.3	-	11.4
33L	30.2%	8.7	7.0	6.6	6.3	9.4
9	19.2%	-	4.3	4.3	-	4.4
4R	4.0%	3.1	3.0	3.0	3.0	3.1
15R	2.3%	16.9	10.4	9.7	10.0	20.0
4L	1.5%	-	6.2	6.2	-	6.3
22L	1.6%	10.8	8.0	7.4	6.7	12.4
Weighted Average ^{\1}		8.7	6.4	6.0	6.2	9.2

\1 Average times are weighted by runway usage.

In the final step of the taxi time analysis, the average additional minutes of taxi time per aircraft were applied to the estimated number of aircraft deiced during the deicing season. It was assumed that the same number of aircraft deiced at Logan in 2008/2009 would be deiced in the 2009/2010 season ("2010"). The distribution of aircraft deiced by aircraft category was assumed to be the same as the distribution of overall Logan aircraft departures for January 2010.

For the forecast year, it was assumed that the number of aircraft deiced in 2010 would increase at the same rate as total Logan Airport operations. Based on the December 2009 FAA Terminal Area Forecast for Logan, aircraft operations are forecast to increase by 17 percent between 2009 and 2020. The aircraft fleet mix was assumed to remain constant over the forecast period.

2.3.4 Total Incremental Taxi Times – 2010 and 2020

Delays resulting from the additional taxi time needed to access Pad Juliet for deicing are summarized in Exhibit 2-9. The total additional taxi times, which are constant in both the Low and High Cases, are estimated at 678 hours in 2010 and 793 hours in 2010. The increase in total taxi times from 2010 to 2020 is a function of the forecast growth in aircraft operations between 2010 and 2020. On average, deicing at Pad Juliet will increase taxi times for each aircraft by 6.6 minutes. Taxi times for widebody and GA aircraft, which primarily depart from the north side of the airport, would increase by the greatest amount - approximately 9 minutes.

Exhibit 2-9: Estimated Incremental Taxi Times, 2010 and 2020

Segment	Aircraft Class	Avg Additional Taxi Time (min)	Aircraft De-Iced		Additional Taxi Time (Min)		Additional Taxi Time (Hr)	
			2010	2020	2010	2020	2010	2020
Sched Psgr	RJ/Turboprop	6.0	2,060	2,410	12,360	14,460	206.0	241.0
Sched Psgr	Narrowbody	6.4	3,231	3,781	20,678	24,198	344.6	403.3
Sched Psgr	Widebody	8.7	606	709	5,272	6,168	87.9	102.8
Cargo	Widebody	6.2	121	142	750	880	12.5	14.7
GA	Business Jet	9.2	175	205	1,610	1,886	26.8	31.4
Total/Avg		6.6	6,193	7,247	40,671	47,593	677.8	793.2

2.4 ESTIMATION OF QUEUING DELAYS

While all deiced aircraft would incur additional taxi time because of the longer distances traveled with the use of Pad Juliet, the aircraft deiced during moderate deicing conditions would also experience congestion and queuing delays at the CDF. As described in Section 2.2, significant numbers of aircraft would require deicing over a small number of hours on moderate deicing days, creating congestion and associated queuing delays at Pad Juliet.

2.4.1 Queuing Model

Estimates of deicing pad delays were obtained through DELAYS, a computer model developed at the MIT Flight Transportation Laboratory and Flight Transportation

Associates, Inc. DELAYS is a queuing theory model based on a set of assumptions that:

- Approximate the probabilistic and time-dependent character of the arrival and service processes.
- Simplify the mathematical analysis sufficiently to make possible the derivation of detailed numerical results about the queuing phenomena that occur during a specified length of time.

When flight demand approaches and ultimately exceeds the capacity of a service facility like Pad Juliet, delays increase exponentially. The DELAYS model is designed to handle time-varying demand that may exceed capacity by spilling excess demand to the next time period.

Pad Juliet with nine aircraft positions was modeled as a single service facility with a capacity of nine times the average dwell time⁵ for a single aircraft. This is appropriate because the Juliet taxiway limits access to the facility to a single stream of aircraft. The actual hourly throughput of Pad Juliet may vary for a number of reasons including the severity of the deicing conditions, the amount of time needed to apply deicing/anti-icing fluids, and the mix and sequencing of aircraft that need to be deiced at a particular time. To account for this variability, two throughput assumptions were made to assess a Low and a High case for queuing delays. Based on the professional judgment of Massport Aviation Operations staff regarding predicted dwell times at the expanded Pad Juliet, the Low Case assumes an average dwell time of 15 minutes and the High case assumes an average dwell time of 20 minutes per aircraft. Thus, the associated throughput capacity of Pad Juliet is assumed to be between 36 (Low Case) and 27 (High Case) aircraft per hour.

The DELAYS model was run for each of the 27 moderate deicing days. The number of aircraft requiring deicing by hour on these days and the hourly capacity of Pad Juliet were the primary inputs to the queuing model. On these days, the number of aircraft that would require deicing, based on the January 2010 airline schedule data and estimates for cargo and GA departures, ranges from less than 50 to more than 400 for the 2010 base year. The average number of aircraft that require deicing on moderate deicing days is 149. Exhibit 2-10 shows the frequency of aircraft deiced on

⁵ Total dwell time at the pad includes the time needed to taxi into position, communicate with the deicing crew prior to the deicing application, apply the deicing fluid, communicate with the crew after the deicing application, and taxi out of position.

the 27 moderate deicing days. On more than 80 percent of these days over 100 aircraft require deicing.

On some of the moderate deicing days, freezing precipitation or light snow occurs during the 11:00 pm hour when departure activity is minimal. On other days there may be light snow or freezing rain throughout the day and, as a result, all departing aircraft require deicing. The most frequent type of moderate deicing involves freezing rain or snow that occurs overnight, requiring the RON aircraft to be deiced before departing the following morning. These conditions occur on 17 of the 27 days. (See Appendix B for the number of aircraft that require deicing by hour on moderate deicing days.)

Exhibit 2-10: Distribution of Number of Aircraft Deiced on Moderate Deicing Days – 2010 Deicing Season

No. of Aircraft Deiced per Day	No. of Moderate Deicing Days	Percent
0-50	5	19%
51-100	0	0%
101-200	17	63%
201-300	0	0%
301-400	3	11%
400-500	2	7%
Total	27	100%

Source: SH&E analysis.

For the future year analysis, the number of aircraft requiring deicing on the moderate deicing days was assumed to increase by 17 percent, the same rate as total Logan Airport operations growth forecast by the FAA.

The results of the queuing analysis provided the average minutes of queuing delay per aircraft for moderate deicing days. (See Appendix C for the estimated average queuing delays by day.) The average queuing time per aircraft in the base year ranges from 7.5 minutes in the Low Case to 36.5 minutes in the High Case. For the forecast year, the average delay per aircraft ranges from 17.8 minutes to 71.7 minutes. Total queuing delays were then estimated by multiplying the average delays per aircraft by the estimated number of aircraft that would require deicing on moderate deicing days in 2010 and 2020.

2.4.2 Total Queuing Delays – 2010 and 2020

Queuing delays for the aircraft using Pad Juliet during moderate deicing conditions vary for the Low and High Cases because of the different assumptions regarding aircraft throughput at Pad Juliet. In the Low Case, which assumes that 36 aircraft can be deiced at pad Juliet in an hour, queuing delays are estimated at 398 hours in 2010 and 1,107 hours in 2020. The High Case assumes that Pad Juliet's hourly throughput is 27 aircraft. As a result of the lower throughput, the queuing delays in the High Case increase to 1,938 hours in 2010 and 4,457 hours in 2020. (See Exhibit 2-11)

Exhibit 2-11: Estimated Aircraft Queuing Delays – 2010 and 2020

Segment	Aircraft Class	Avg Delay Per Acft (Min)		Aircraft Deiced		Queuing Delay (Hr)	
		2010	2020	2010	2020	2010	2020
Low Case							
Sched Psgr	RJ/Turboprop	7.5	17.8	1,060	1,240	132.5	367.9
Sched Psgr	Narrowbody	7.5	17.8	1,662	1,946	207.8	577.3
Sched Psgr	Widebody	7.5	17.8	312	365	39.0	108.3
Cargo	Widebody	7.5	17.8	62	73	7.8	21.7
GA	Business Jet	7.5	17.8	90	106	11.3	31.4
Total/Avg		7.5	17.8	3,186	3,730	398.3	1,106.6
High Case							
Sched Psgr	RJ/Turboprop	36.5	71.7	1,060	1,240	644.8	1,481.8
Sched Psgr	Narrowbody	36.5	71.7	1,662	1,946	1,011.1	2,325.5
Sched Psgr	Widebody	36.5	71.7	312	365	189.8	436.2
Cargo	Widebody	36.5	71.7	62	73	37.7	87.2
GA	Business Jet	36.5	71.7	90	106	54.8	126.7
Total/Avg		36.5	71.7	3,186	3,730	1,938.2	4,457.4

Source: SH&E analysis.

3

ESTIMATION OF DELAY COSTS

3.1 OVERVIEW OF ANALYTICAL APPROACH

SH&E estimated the costs of centralized deicing-related delays to airline and air passengers. The delays incurred by airlines would result in higher operating costs including expenses for airline flight crews, fuel and maintenance, and aircraft ownership costs. Delays to passengers would cause losses in productivity, business opportunities or leisure time. SH&E used standard costing methodologies to estimate the costs to both airlines and passengers:

- **Cost to Airlines and Private Aircraft Operators** – was measured in terms of aircraft operating costs for representative aircraft types in the Logan fleet mix. Unit operating costs were adjusted to reflect the phase of flight since all delays related to the use of Pad Juliet are incurred while taxiing or queuing at pad.
- **Cost to Passengers** – was measured in terms of the value of passenger time based on FAA guidance on the economic values to be used in investment or regulatory decisions. The Logan aircraft fleet mix and average load factors were used to estimate the number of passengers that would be affected by deicing-related delays.

3.2 COST OF DELAYS TO AIRLINES AND PRIVATE AIRCRAFT OPERATORS

Aircraft operating costs include crew costs, fuel expense, maintenance, and aircraft ownership costs. To estimate the costs of delays to airlines and other aircraft operators, it is necessary to determine the incremental costs related to delays, which vary depending upon the specific cost category and the phase of flight. For example, for flights delayed while airborne the carrier incurs fuel expense at roughly the average fuel cost per block hour. However, for delays on the ground, such as taxiing delays, aircraft are operating at very low power levels when fuel costs are much lower than the average unit fuel cost.

To account for cost differentials by phase of flight, SH&E applied factors for each cost category to represent the costs incurred during the taxi-out and queuing phases. (See Exhibit 3-1) For fuel, 25 percent of the average unit cost was assumed to relate to the taxi phase. Similar to the fuel costs, aircraft maintenance costs would be lower than average during the taxi/queuing phase, so it was estimated that airlines would incur 50 percent of the average maintenance cost per block hour while taxiing or

queuing at Pad Juliet. Crew costs (including, flight deck and cabin personnel) vary in direct proportion to the number of hours worked, so crew costs were accrued at 100 percent of the average crew cost per block hour. Aircraft ownership expenses include the cost of capital and are included in the cost estimates because delays create inefficiencies in the air traffic system and require airlines to use more aircraft to provide the same level of service. The incremental aircraft ownership expense related to delays was estimated at 25 percent of the average hourly cost.

The estimate of aircraft operating costs was based on representative aircraft types from the Logan fleet mix. Representative types for the passenger airline fleet were based on the predominant types in the January 2010 airline schedule and include the CRJ-100/200 in the regional jet category; the Airbus A310/A320 family in the narrowbody category; and the Boeing 767-300 in the widebody category. For cargo aircraft, the Airbus A300-600 was selected based on all-cargo operations at Logan reported in the US DOT, T-100 Database for YE October 2009. The Beechjet 400 was selected as the most prevalent GA type based on the 2008 Logan fleet mix that was analyzed in the *Boston Logan International Airport 2008 Environmental Data Report*.

Average aircraft operating costs for passenger and cargo airlines were based on industry average operating costs as reported in the US DOT Form 41 Database for the YE 3Q 2009. The source for Beechjet 400 operating costs was the *2008 Aircraft Costs Evaluator* prepared by Conklin De Decker Associates.

Exhibit 3-1 summarizes reported average operating costs for the representative aircraft types and the costs assumptions used in the cost of delay analysis. The assumed average hourly cost of delay for narrowbody passenger aircraft, which represent 52 percent of the Logan fleet mix for the analysis years, is \$1,905.

Exhibit 3-2 summarizes the total cost of delays to airlines. In the Low Case, delay costs are estimated at \$1.9 million in 2010 and \$3.3 million in 2020. Airline costs in the High Case are estimated at \$4.5 million in 2010 and \$9.1 million in 2020. (See Exhibit 3-2) More than 90 percent of the increased aircraft operating costs are borne by passenger airlines. Total aircraft operating costs related to the deicing delays increase over the forecast period faster than the growth in aircraft operations because queuing delays increase at a faster rate than operations.

Exhibit 3-1: Average Aircraft Operating Costs per Block Hour

Aircraft Category	Representative Aircraft	Fuel/Oil	Maintenance	Flight Crew	Cabin Crew	Ownership	Total Cost per BH
Reported Average Block Hour Costs							
Passenger Aircraft							
RJ	CRJ-100/CRJ-200	\$330	\$334	\$186	\$182	\$372	\$1,404
NB	A319/A320/A321	\$1,558	\$630	\$514	\$547	\$556	\$3,806
WB	B767-300	\$3,608	\$1,012	\$1,008	\$1,095	\$850	\$7,575
Cargo	A300-600	\$2,791	\$2,054	\$2,140	na	\$2,225	\$9,210
GA	Beechjet 400	\$1,402	\$796	\$429	na	\$440	\$3,066
Estimated Average Cost per Hour of Delay							
Passenger Aircraft							
RJ	CRJ-100/CRJ-200	\$82	\$167	\$186	\$182	\$93	\$711
NB	A319/A320/A321	\$389	\$315	\$514	\$547	\$139	\$1,905
WB	B767-300	\$902	\$506	\$1,008	\$1,095	\$213	\$3,724
Cargo	A300-600	\$698	\$1,027	\$2,140	na	\$556	\$4,421
GA	Hawker 400	\$350	\$398	\$429	na	\$110	\$1,287

na = not applicable

Source: US DOT, Form41 Database, YE 3Q 2009 and Conklin de Decker Associates, Inc, 2008 (for GA aircraft costs)

Exhibit 3-2: Estimated Aircraft Operating Costs of Incremental Deicing Delays – 2010 and 2020

Segment	Aircraft Class	Estiamted Block Hour Cost	2010		2020	
			Total Delay Hours	Incremental Block Hour Costs	Total Delay Hours	Incremental Aircraft Costs
Low Scenario						
Sched Psgr	RJ/Turboprop	\$711	338.5	\$240,504	608.9	\$432,600
Sched Psgr	Narrowbody	\$1,905	552.4	\$1,052,303	980.6	\$1,868,081
Sched Psgr	Widebody	\$3,724	126.9	\$472,477	211.1	\$786,114
Cargo	Widebody	\$4,421	20.3	\$89,540	36.3	\$160,615
GA	Business Jet	\$1,287	38.1	\$49,021	62.9	\$80,939
Total			1,076.1	\$1,903,845	1,899.8	\$3,328,349
High Scenario						
Sched Psgr	RJ/Turboprop	\$711	850.8	\$604,517	1,722.8	\$1,224,049
Sched Psgr	Narrowbody	\$1,905	1,355.7	\$2,582,589	2,728.8	\$5,198,320
Sched Psgr	Widebody	\$3,724	277.7	\$1,034,071	539.0	\$2,007,215
Cargo	Widebody	\$4,421	50.2	\$222,023	101.9	\$450,537
GA	Business Jet	\$1,287	81.6	\$105,014	158.1	\$203,511
Total			2,616.0	\$4,548,214	5,250.6	\$9,083,632

3.3 COST OF DELAYS TO PASSENGERS

The cost of delays to passengers is measured in terms of the value of lost time. Delays incurred while traveling impose an opportunity cost that equals the passenger's value of time in forgone work or leisure activities. The FAA provides specific economic values of passenger time for use in investment or regulatory decisions based on guidance provided by the US DOT. These values are summarized in Exhibit 3-3. The recommended values for all purposes of travel were used to estimate the cost of delays to air passengers.

Exhibit 3-3: Passenger Value of Time Estimates

Category	Passenger Value of Time		
	Recommended	Low	High
Air Carrier			
Personal	\$23.30	\$20.00	\$30.00
Business	\$40.10	\$32.10	\$48.10
All Purposes	\$28.60	\$23.80	\$35.60
General Aviation			
Personal	\$31.50	-	-
Business	\$45.00	-	-
All Purposes	\$37.20	-	-

Sources: FAA, Economic Values for FAA Investment and Regulatory Decisions, A Guide, Final Report revised October 3, 2007.

The number of passengers that would incur delays as a result of the centralized deicing activities was based on the average aircraft size for each major aircraft category and actual average passenger load factors at Logan Airport. The January 2010 airline schedule was used to determine the average seats per aircraft in each aircraft size category. The US DOT, T100 Database for the YE October 2009 was used to obtain average Logan load factors. The average number of passengers per GA departure was based on reported Massport statistics for CY 2009.

Exhibit 3-4 shows the calculation of the total cost of deicing delays to air passengers at Logan Airport. In the Low Case, total passenger costs related to the use of Pad Juliet are estimated at \$2.5 million in 2010 and \$4.4 million in 2020. Under the High Case assumptions, passenger costs increase to \$6.0 million in 2010 and \$11.9 million in 2020.

Exhibit 3-4: Estimated Passenger Costs of Deicing Delays – 2010 and 2020

Segment	Aircraft Class	Average Seats per Aircraft ¹¹	Average Psgr Load Factor ¹²	Average Psgrs per Departure ¹³	Hourly Value of Psgr Time ¹⁴	2010			2020		
		Total Aircraft Delay Hours	Total Psgr Delay Hours ¹⁵	Total Cost of Psgr Delays ¹⁶	Total Aircraft Delay Hours	Total Psgr Delay Hours ¹⁵	Total Cost of Psgr Delays ¹⁶				
Low Scenario											
Sched Psgr	RJ/Turboprop	42	64.7%	27	\$28.60	338.5	9,196	\$263,004	608.9	16,541	\$473,070
Sched Psgr	Narrowbody	133	72.8%	97	\$28.60	552.4	53,520	\$1,530,667	980.6	95,010	\$2,717,289
Sched Psgr	Widebody	264	72.6%	192	\$28.60	126.9	24,324	\$695,676	211.1	40,471	\$1,157,477
GA	Business Jet			4	\$37.20	38.1	151	\$5,632	62.9	250	\$9,298
Total						1,055.8	87,191	\$2,494,979	1,863.5	152,272	\$4,357,134
High Scenario											
Sched Psgr	RJ/Turboprop	42	64.7%	27	\$28.60	850.8	23,114	\$661,071	1,722.8	46,803	\$1,338,561
Sched Psgr	Narrowbody	133	72.8%	97	\$28.60	1,355.7	131,350	\$3,756,604	2,728.8	264,385	\$7,561,414
Sched Psgr	Widebody	264	72.6%	192	\$28.60	277.7	53,237	\$1,522,569	539.0	103,337	\$2,955,430
GA	Business Jet			4	\$37.20	81.6	324	\$12,064	158.1	628	\$23,380
Total						2,565.8	208,025	\$5,952,308	5,148.7	415,153	\$11,878,785

Notes:

\1 Average seats per scheduled departure from OAG January 2010.

\2 Average passenger load factors at Boston Logan Airport as reported in US DOT, T-100 Database.

\3 Average seats per departure times average passenger load factor.

\4 FAA recommended values of time for airline and general aviation passengers

\5 Average passengers per departure times total delay hours.

\6 Total passenger delay hours times hourly value of passenger time.

Sources: OAG, January 2010; US DOT, T-100 Database, August 2008 to July 2009; FAA, Economic Values for FAA Investment and Regulatory Decisions, A Guide, Final Report, Revised October 3, 2007

The combined cost of delays to aircraft operators and passengers associated with the use of a CDF in the 2010 base year is estimated at \$4.4 million (Low Case) to \$10.5 million (High Case). In 2020, the total cost of delay is estimated at \$7.7 million (Low Case) to \$21.0 million (High Case).



Appendix A: AIRLINE TERMINAL LOCATIONS

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G:\ABO\Drawings\A1\ROPS\Gate Reference Maps\2010-01-27 Gate Reference Map.dwg

Disclaimer: Information presented on this drawing is subject to continuous modification and updating. Therefore **NO WARRANTY OF ANY KIND EITHER EXPRESSED OR IMPLIED** is offered to the user. The information is planning oriented and may not reflect "As-Built" conditions. All square footage numbers are subject to Field Survey Verification.



Terminal Layout

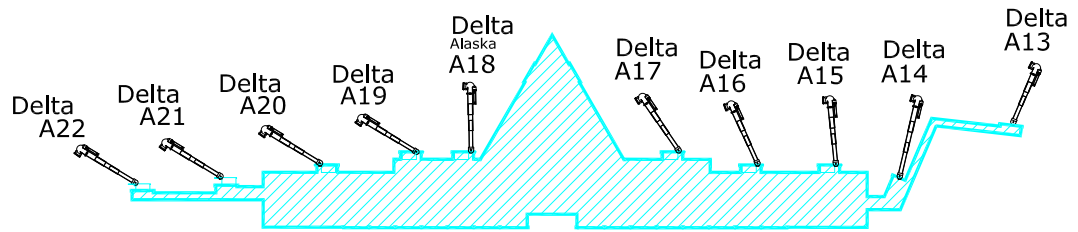
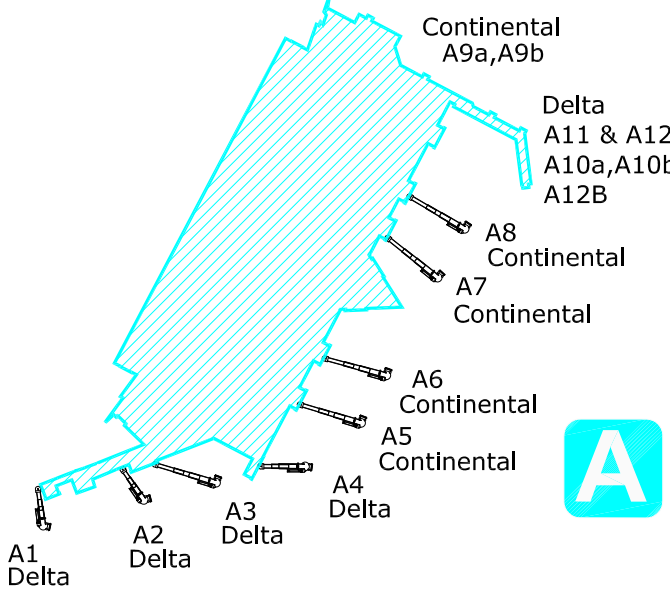
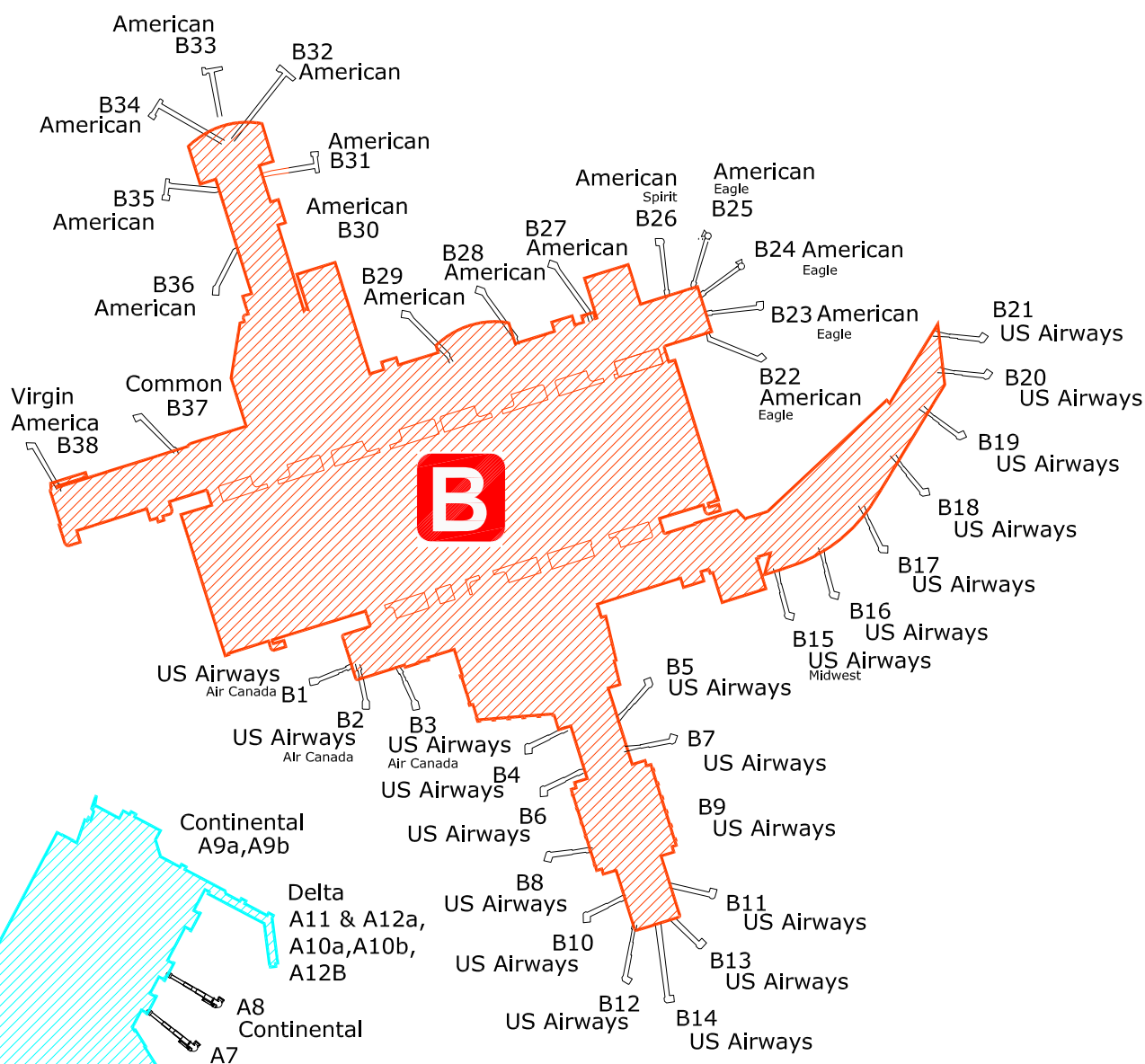
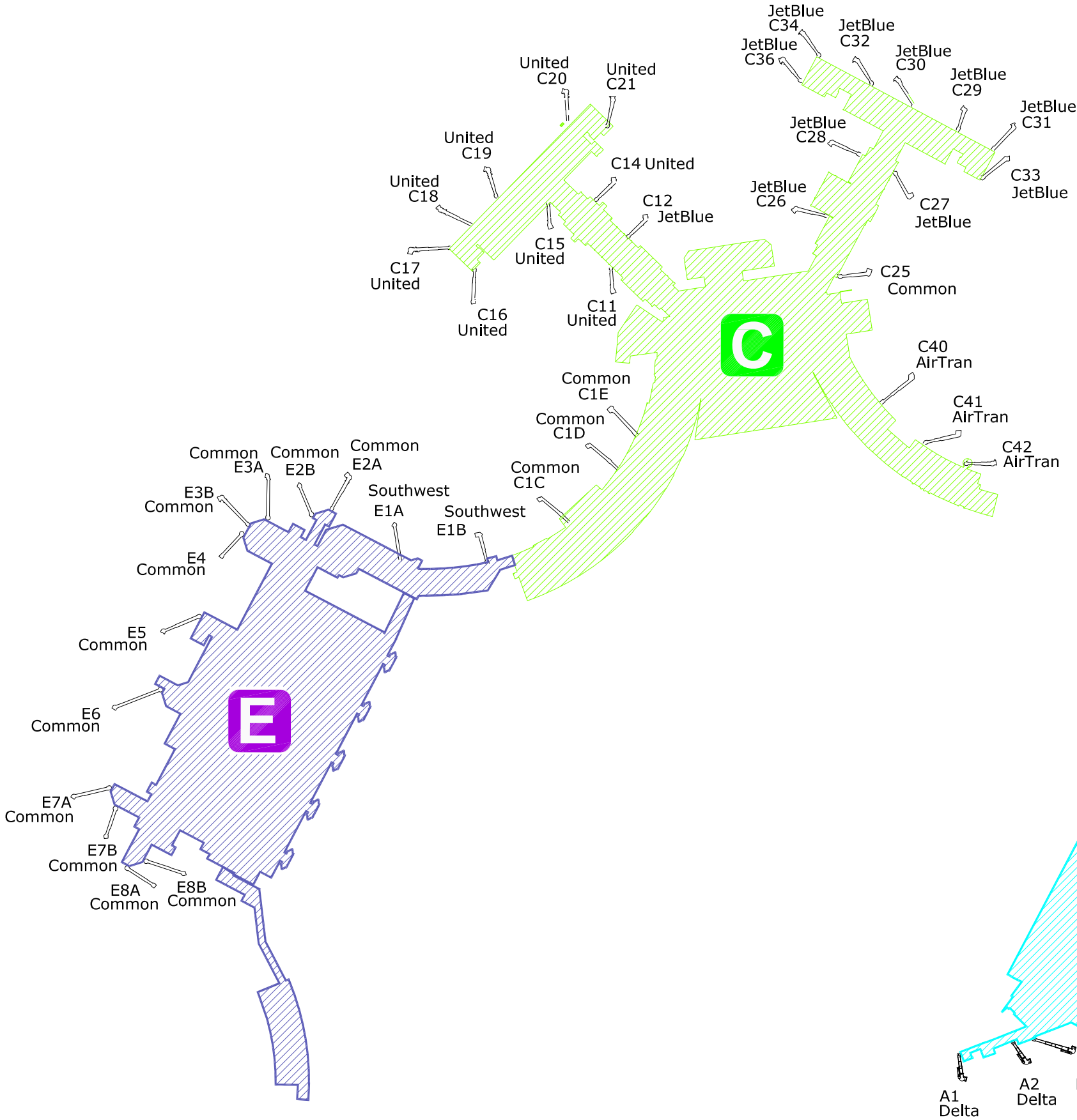
Logan International Airport

Drawn By:	KJG
Requested By:	
Date:	01/27/2010
Scale:	Not to Scale
Agmt #:	

Airline Gate Locations
As of 01/27/2010

Exhibit
A

Sheet
1 of 1





Appendix B: NUMBER OF AIRCRAFT REQUIRING DEICING ON MODERATE DEICING DAYS

Hourly Departures for Moderate Deicing Days at Logan International Airport - All Aircraft Requiring De-Icing

Winter Season 2009/2010

	Date																											
Hour	Day1	Day2	Day3	Day4	Day5	Day6	Day7	Day8	Day9	Day10	Day11	Day12	Day13	Day14	Day15	Day16	Day17	Day18	Day19	Day20	Day21	Day22	Day23	Day24	Day25	Day26	Day27	
0	0	0	0	1	1	1	0	1	0	0	1	1	0	1	0	1	0	1	0	0	0	1	0	1	0	0	0	
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2	0	0	0	1	1	1	1	0	1	1	1	1	0	1	0	1	0	1	1	0	0	0	0	0	0	1	0	
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5	9	8	0	8	9	9	8	9	8	8	8	8	0	9	0	8	0	8	9	0	0	8	0	8	8	8	9	8
6	40	40	0	36	40	40	36	36	36	36	36	36	0	40	0	36	0	36	40	0	0	36	0	36	36	36	40	
7	33	28	0	28	33	33	28	33	28	28	28	28	0	33	0	28	0	28	28	0	0	28	0	28	33	28	33	
8	41	19	0	19	41	41	19	19	19	19	19	19	0	41	0	19	0	19	19	0	0	19	0	19	41	19	41	
9	36	6	0	6	36	36	6	36	6	6	6	6	0	36	0	6	0	6	6	0	0	6	0	6	36	6	36	
10	22	3	0	3	22	22	3	3	3	3	3	3	0	3	0	3	0	3	3	0	0	3	0	3	22	22	3	
11	28	1	0	1	28	28	1	1	1	1	1	1	0	1	0	1	0	1	1	0	0	1	0	1	28	28	1	
12	18	0	0	0	18	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	0	0	
13	20	0	0	0	20	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	20	
14	29	0	0	0	29	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29	0	29	
15	19	0	0	0	19	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	
16	32	0	0	0	32	0	0	0	0	0	0	0	0	0	0	0	32	0	0	0	0	0	0	0	0	0	32	
17	41	0	0	0	41	41	0	0	0	0	0	0	0	0	0	0	41	0	0	41	0	0	0	41	0	41	41	
18	0	0	0	0	37	37	0	0	0	0	0	0	0	0	0	0	37	0	0	37	0	0	0	0	0	0	0	
19	0	0	0	0	28	28	0	0	0	0	28	28	0	0	0	0	28	0	0	28	0	0	0	0	0	0	0	
20	0	0	0	0	17	17	0	0	0	0	17	17	17	0	0	0	17	0	0	17	0	0	17	17	17	0	0	
21	0	0	0	0	3	0	0	0	0	0	3	0	3	0	0	0	0	0	0	3	0	0	3	3	3	0	0	
22	0	0	0	0	3	0	0	0	0	0	3	0	3	0	0	0	0	0	0	3	3	0	0	0	3	0	0	
23	0	0	2	0	2	0	0	0	0	0	2	0	2	0	2	0	2	0	0	0	2	0	0	0	2	0	0	
Total	368	105	2	103	460	420	102	138	102	102	156	148	25	165	2	103	157	103	107	129	5	102	20	122	337	149	303	

Notes:

Includes 27 moderate de-icing days based on the 2008/2009 season; excludes heavy snow days with over 4 inches of snow and light defrosting days: 12/7/2008; 12/9/2008; 12/16/2008; 12/17/2008; 12/20/2008; 12/21/2008; 12/30/2008; 1/1/2009; 1/3/2009; 1/5/2009; 1/7/2009; 1/8/2009; 1/10/2009; 1/12/2009; 1/17/2009; 1/19/2009; 1/20/2009; 1/21/2009; 2/4/2009; 2/18/2009; 2/19/2009; 2/20/2009; 2/22/2009; 2/23/2009; 3/1/2009; 3/3/2009; 3/9/2009.

Number of aircraft de-iced from MPA database with adjustments for underreported airlines, cargo and GA.

Source: OAG, Scheduled weekday departures for January 2010; Cargo and GA activity estimated.

Hourly Departures for Moderate Deicing Days at Logan International Airport - All Aircraft Requiring De-Icing

Winter Season 2019/2020

	Date																										
Hour	Day1	Day2	Day3	Day4	Day5	Day6	Day7	Day8	Day9	Day10	Day11	Day12	Day13	Day14	Day15	Day16	Day17	Day18	Day19	Day20	Day21	Day22	Day23	Day24	Day25	Day26	Day27
0	0	0	0	1	1	1	0	1	0	0	1	1	0	1	0	1	0	1	0	0	0	1	0	1	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	1	1	1	1	0	1	1	1	1	0	1	0	1	0	1	1	0	0	0	0	0	0	1	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	11	9	0	9	11	11	9	11	9	9	9	9	0	11	0	9	0	9	11	0	0	9	0	9	9	11	9
6	47	47	0	42	47	47	42	42	42	42	42	42	0	47	0	42	0	42	47	0	0	42	0	42	42	42	47
7	39	33	0	33	39	39	33	39	33	33	33	33	0	39	0	33	0	33	33	0	0	33	0	33	39	33	39
8	48	22	0	22	48	48	22	22	22	22	22	22	0	48	0	22	0	22	22	0	0	22	0	22	48	22	48
9	42	7	0	7	42	42	7	42	7	7	7	7	0	42	0	7	0	7	7	0	0	7	0	7	42	7	42
10	26	4	0	4	26	26	4	4	4	4	4	4	0	4	0	4	0	4	4	0	0	4	0	4	26	26	4
11	33	1	0	1	33	33	1	1	1	1	1	1	0	1	0	1	0	1	1	0	0	1	0	1	33	33	1
12	21	0	0	0	21	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	0	0
13	23	0	0	0	23	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	0	23
14	34	0	0	0	34	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34	0	34
15	22	0	0	0	22	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22
16	37	0	0	0	37	0	0	0	0	0	0	0	0	0	0	0	37	0	0	0	0	0	0	0	0	0	37
17	48	0	0	0	48	48	0	0	0	0	0	0	0	0	0	0	48	0	0	48	0	0	0	0	48	0	48
18	0	0	0	0	43	43	0	0	0	0	0	0	0	0	0	0	43	0	0	43	0	0	0	0	0	0	0
19	0	0	0	0	33	33	0	0	0	0	33	33	0	0	0	0	33	0	0	33	0	0	0	0	0	0	0
20	0	0	0	0	20	20	0	0	0	0	20	20	20	0	0	0	20	0	0	20	0	0	20	20	20	0	0
21	0	0	0	0	4	0	0	0	0	0	4	0	4	0	0	0	0	0	0	4	0	0	4	4	4	0	0
22	0	0	0	0	4	0	0	0	0	0	4	0	4	0	0	0	0	0	0	4	4	0	0	0	4	0	0
23	0	0	2	0	2	0	0	0	0	0	2	0	2	0	2	0	2	0	0	0	2	0	0	0	2	0	0
Total	431	123	2	120	539	492	119	162	119	119	183	173	30	194	2	120	183	120	126	152	6	119	24	143	395	175	354

Notes:

Includes 27 moderate de-icing days based on the 2008/2009 season; excludes heavy snow days with over 4 inches of snow and light defrosting days: 12/7/2008; 12/9/2008; 12/16/2008; 12/17/2008; 12/20/2008; 12/21/2008; 12/30/2008; 1/1/2009; 1/3/2009; 1/5/2009; 1/7/2009; 1/8/2009; 1/10/2009; 1/12/2009; 1/17/2009; 1/19/2009; 1/20/2009; 1/21/2009; 2/4/2009; 2/18/2009; 2/19/2009; 2/20/2009; 2/22/2009; 2/23/2009; 3/1/2009; 3/3/2009; 3/9/2009.
Number of aircraft de-iced from MPA database with adjustments for underreported airlines, cargo and GA.

Source: OAG, Scheduled weekday departures for January 2010 time forecast growth factor. Estimated 2010 cargo and GA activity times growth factor.



Appendix C: ESTIMATED QUEUING DELAYS ON MODERATE DEICING DAYS

**Estimated Queuing Delays on Moderate Deicing Days
2010 and 2020**

Year	Day	Total Aircraft Depts.	Pad Juliet Throughput Assumption			
			27 per Hour		36 per Hour	
			Total Delay (hr)	Average Delay (min)	Total Delay (hr)	Average Delay (min)
2010	1	368	361.2	59.1	57.5	9.4
2010	2	105	36.4	20.9	10.2	5.8
2010	3	2	-	0.1	-	0.1
2010	4	103	27.1	15.8	6.9	4.0
2010	5	460	506.0	66.1	76.7	10.0
2010	6	420	381.1	54.6	69.9	10.0
2010	7	102	27.1	16.0	6.9	4.0
2010	8	138	56.8	24.6	12.9	5.6
2010	9	102	27.1	16.0	6.9	4.0
2010	10	102	27.1	16.0	6.9	4.0
2010	11	156	32.0	12.4	8.5	3.3
2010	12	148	31.9	13.0	8.4	3.4
2010	13	25	0.6	1.4	0.3	0.6
2010	14	165	131.4	47.8	36.6	13.3
2010	15	2	-	0.1	-	0.1
2010	16	103	27.1	15.8	6.9	4.0
2010	17	157	116.4	44.4	29.1	11.1
2010	18	103	27.1	15.8	6.9	4.0
2010	19	107	36.4	20.5	10.2	5.7
2010	20	129	81.9	38.2	22.4	10.4
2010	21	5	-	0.1	-	0.1
2010	22	102	27.1	16.0	6.9	4.0
2010	23	20	0.6	1.8	0.3	0.8
2010	24	122	27.6	13.6	7.1	3.5
2010	25	337	252.7	45.1	45.5	8.1
2010	26	149	32.8	13.3	8.7	3.5
2010	27	303	171.8	34.1	48.9	9.7
Overall			2,446.9	36.5	501.2	7.5
2020	1	431	886.2	123.8	180.7	25.2
2020	2	123	72.3	35.4	24.7	12.1
2020	3	2	-	0.1	-	0.1
2020	4	120	56.1	28.1	16.5	8.3
2020	5	539	1,313.8	146.5	239.5	26.7
2020	6	492	983.7	120.4	214.3	26.1
2020	7	119	56.1	28.4	16.5	8.3
2020	8	162	122.2	45.1	32.5	12.1
2020	9	119	56.1	28.4	16.5	8.3
2020	10	119	56.1	28.4	16.5	8.3
2020	11	183	66.5	21.9	19.7	6.5
2020	12	173	66.4	23.1	19.7	6.8
2020	13	30	1.1	2.1	0.4	0.8
2020	14	194	243.2	75.3	95.3	29.5
2020	15	2	-	0.1	-	0.1
2020	16	120	56.1	28.1	16.5	8.3
2020	17	183	217.0	71.0	76.0	24.9
2020	18	120	56.1	28.1	16.5	8.3
2020	19	126	72.5	34.7	24.8	11.8
2020	20	152	153.5	60.8	56.3	22.2
2020	21	6	-	0.2	-	0.1
2020	22	119	56.1	28.4	16.5	8.3
2020	23	24	1.0	2.6	0.4	1.0
2020	24	143	57.1	24.0	16.9	7.1
2020	25	395	575.9	87.8	140.5	21.3
2020	26	175	71.4	24.7	20.3	7.0
2020	27	354	336.7	57.2	120.5	20.4
Overall			5,633.2	71.7	1,398.4	17.8



Appendix D: CONSULTANT RESUMES

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Area of Specialization:

Ms. Jones has more than 20 years of experience analyzing the economics of the air transportation industry. She has directed the forecasting and economic analysis for a number of major, high profile studies involving airports in the US and throughout the world. Her areas of expertise include market demand analysis, aviation activity forecasting, airport system planning, and air service marketing. She has prepared numerous airport activity forecasts for airports ranging from large hubs to reliever and general aviation airports.

Relevant Project Experience:**Client****Engagement****Aviation Activity Forecasts**

Agunsa
Burlington International Airport
Capital Region Airport Authority

London Luton Airport
Los Angeles World Airports
Massport/Logan International Airport
Massport/Logan International Airport
Massport/Hanscom Field
Pacific Airport Group
San Diego County Regional Airport
Authority
San Diego Association of Governments

Guayaquil, Ecuador Airport Privatization Bid
Financial Feasibility Study
Richmond International Airport Contingency
Planning
Airport Activity Forecasts for TBI
Van Nuys Airport FAR Part 161 Study
Airside Improvements Project EIS/EIR
Environmental Status and Planning Report
Environmental Status and Planning Report
Mexican Airport Privatization Bid

Long-term Aviation Activity Forecasts
Future Market Demand and Opportunities

System Studies

FAA/Massport/MAC
Bay Area Regional Airport Planning
Committee
New Mexico Aviation Division
Virginia Department of Aviation

New England Regional Airport System Plan

Regional Airport System Plan Study
New Mexico Statewide Air Service Study
Virginia Commercial Airport System Study

Other Experience

Capital Region Airport Commission
Arizona Department of Transportation
Atlanta Chamber of Commerce
Massachusetts Aeronautics Commission
Massport
San Diego Association of Governments
US GAO

Air Service Marketing for RIC
Economic Impact of Aviation in Arizona
Competitive Service Analysis
Economic Impact Study
Financial Feasibility Study
Aviation Transportation Action Program
Evaluation of Airline Costs for Passenger and
Property Screening

Background:

Ms. Jones joined SH&E as a Research Associate in 1985.

Education:

BA, cum laude, Economics with a concentration in Mathematics,
Wellesley College
Completed coursework towards MBA at Babson College

Year Joined Firm: 1985

Area of Specialization:

Mr. Hollander has thirty years of experience in air transportation analysis. He has participated in over 150 projects for major airlines, airports, regional carriers, local, state and federal government agencies. He leads SH&E forecasting projects and his areas of expertise include demand analysis, passenger traffic and aircraft fleet forecasting, and airline route planning and profitability analysis.

Relevant Project Experience:**Client**

Athens, Greece
Bay Area Regional Airport Planning
Committee
Commonwealth of Virginia
Delta Air Lines

London Luton Airport
Massport (Boston Logan Int'l.)
Massport (Boston Logan Int'l.)
Massport (Boston Logan Int'l.)
Port Authority of NY & NJ

San Diego International Airport
Sanford/Orlando Intl. Airport
Southern California (SCAG)
Southwest Airlines
US GAO

US Airways

Virgin America

Engagement

Aviation Activity Forecasts for New Airport

Regional Airport System Plan Study
State Airport System Study
Analysis of Gate Demand at Logan Airport for
Bond Feasibility Assessment
Airport Traffic Forecasts
Aviation Activity Forecasts
Demand Management Program
Airside Improvements Project EIS/EIR
Analysis of Regional Jet Demand at LGA

Long-Term Activity Forecasts
Air Service Marketing and Strategy
Regional Airport Demand Model
Financial Impact of FAA Noise Regulations
Evaluation of Airline Costs for Passenger and
Property Screening
Traffic and Revenue Impacts of Potential Carrier
Acquisition
Route Planning Analysis for New Entrant

Background:

Mr. Hollander joined SH&E after graduating from Duke University in 1976. He has led forecasting projects for airports, airlines and government agencies. He prepared long-term activity forecasts for San Diego International Airport and evaluated the airport's ability to handle unconstrained demand. At Boston Logan, he developed aviation activity forecasts and prepared a demand management plan to deal with future over-scheduling conditions. He directed the development of a regional airport demand model for the greater Los Angeles region to evaluate strategies for accommodating future air travel demand. He performs network and route-specific traffic and revenue forecasts for major airlines.

Education: BA, Economics, Duke University.

Year Joined Firm: 1976

Area of Specialization:

Helen Lin is a Manager at SH&E, specializing in air traffic analysis and route forecasting. Ms. Lin has worked on air service marketing, economic impact studies and other traffic and performance benchmarking studies for airport clients including Baltimore/Washington International Airport, Los Angeles International Airport, Boston Logan International Airport, Denver International Airport, and Long Island MacArthur Airport. She has worked extensively on state airport system planning and has significant interest in studying traffic trends in state, regional and other multi-airport systems. Ms. Lin is also experienced in airline route forecasting and airline network development. She is an experienced user of Networks, SH&E's in-house network modeling tool.

Relevant Project Experience:

<u>Client</u>	<u>Engagement</u>
Washington State DOT	Washington Long-Term Air Transportation Study (LATS): development of long-term air demand forecasts for Washington's 138 public airports, analysis of regional commercial service and general aviation trends, evaluation of potential alternate airports for constrained state airports
Bay Area Regional Airport Planning	Bay Area Regional Airport System Plan (RASP): Committee assessment of the ability of secondary airports and external airports to provide relief to constrained Bay Area airports, forecasting of feasible air services at potential reliever airports
Massport/Boston Logan Airport	2008 Environmental Data Report: analysis of Logan Airport and regional airport activity trends.
Baltimore/Washington International	On-call air service marketing: route economic impact analysis, carrier interlining analysis, airport traffic/fare/delay benchmarking
Los Angeles World Airports	On-call air service marketing: carrier route forecasts, regional strategy development
Huntsville Airport VARIG	Air cargo marketing Development of alliance and international route strategy
Zephyr Management Bellview Airlines	Feasibility study for a Pan-African airline Development of airline business plan

Background:

Ms. Lin joined SH&E in September 2006, after obtaining a degree in Mathematics from the Massachusetts Institute of Technology. Her interest in aviation stems from her experience growing up abroad, living and studying in diverse places including South Africa, Swaziland, Taiwan, Japan, the Caribbean Islands, and Uzbekistan.

Education: BS, Mathematics, MIT

Year Joined Firm: 2006

Languages: English, Mandarin Chinese

William C. Hoffman

President

FTA

Education

Massachusetts Institute of Technology.
M.S. in Management Science, 1978
M.S. in Aeronautics and Astronautics, 1967
B.S. in Aeronautics and Astronautics, 1964

Experience

Mr. Hoffman is the President of Flight Transportation Associates. He specializes in airport planning and operations, aviation forecasting, air traffic control and navigation technology, and computer simulation and modeling.

New Las Vegas Supplemental Airport

Led the Planning Group for Vanasse, Hangen & Brustlin (VHB) on the EIS for the proposed new airport at Ivanpah, Nevada. Organized the technical approach for conducting the operational and environmental analyses. Reviewed demand forecasts for LAS & IVP in comparison with FAA Terminal Area Forecasts, Enhanced Traffic Management System Counts and other historical data to develop the Purpose and Need and conduct the Alternatives Analysis. Developed input data assumptions for the Total Airspace and Airport Modeler (TAAM) simulations.

Philadelphia Airport Capacity Enhancement EIS

Currently working with the VHB team to prepare an Environmental Impact Statement for major capacity enhancements to the Philadelphia airport. Concepts being examined include adding/extending runways to the existing layout, to reconfiguring the entire airfield. This project was the first airport to be designated for streamlining by the Secretary of Transportation. Mr. Hoffman has been involved from the initial scoping to the latest Master Plan revisions. Principal efforts involved: independent review of the Master Plan concepts, evaluating the purpose and need for the improvements, identifying and analyzing the alternatives to be considered in the EIS, reviewing and approving the airport forecast, defining the future scenarios to be modeled, defining the TAAM simulation parameters, evaluating the modeling results, and processing the TAAM results for the air quality and noise modeling analyses.

Philadelphia Airport Runway 17-35 EIS

Worked with the VHB team to prepare an Environmental Impact Statement for extending the crosswind runway 17-35 to 6,500 feet. This project was split off from the PHL Capacity Enhancement Program (above) in order to achieve near-term improvements in PHL capacity and airfield delays. Mr. Hoffman was responsible for independently reviewing concepts in the Master Plan for delay reduction benefits and airfield/airspace operational impacts, and to validate the simulation modeling. Principal efforts involved: reviewing and evaluating the purpose and need for the improvements; identifying and analyzing the alternatives to be considered in the EIS; assessing the impacts that construction would have on normal traffic handling; participating on the Planning Subcommittee; examining air traffic obstacles posed by ships in the Delaware River; supported the TAAM modeling effort; and combining TAAM results to produce the airfield data needed for the air quality (EDMS) and noise (INM) analyses of all alternatives.

Logan Airside Improvements EIS/EIR

Refined the analysis methodology and developed high Regional Jet forecast scenarios for evaluation under the EIS/EIR. Evaluated regional jet performance and future impacts on Logan operations. Evaluated new wake vortex and LAHSO requirements on operations. Conducted computer simulations of airspace, runways and taxiways to estimate runway use and delays. Provided testimony in litigation by Massport to lift an injunction on the runway and by opponents seeking to invalidate the study.

Kingsford-Smith Airport Airfield & Airspace Modeling

Experience (continued)

Analyzed new runway operations and flight tracks developed by the Australian ATC service to minimize the noise impacts of KSA and to distribute those noise impacts in an equitable manner. Conducted airfield modeling of associated airfield improvements to independently assess and prioritize their benefits. Conducted capacity and delay modeling with FLAPS and DELAYSIM, and supported simulation modeling of the proposed taxiway improvements with TAAM. Identified and analyzed additional capacity enhancement measures and operating procedures that would give controllers added flexibility to produce more equitable sharing of noise impacts while further reducing delays.

Inchon International Airport Airspace Design

Designed preliminary airspace layout and procedures for the new international airport under construction to serve Seoul, Korea. Developed arrival and departure routes and instrument procedures for several future development phases with simultaneous operation of the existing and new airports. Simulated airspace operations using FTA's TASIM, and provided inputs for the FAA's SIMMOD. Prepared recommendations concerning the disposition of military operations areas and special use airspace.

Second Major Airport Siting Study, Massachusetts

Managed FTA's involvement in a siting study for a Second Major Airport for the Boston area. Evaluated the economic benefits, market demand, and aeronautical considerations for prospective sites. Computer models of projected passenger demand were developed, and the Integrated Noise Model was used to estimate noise impacts.

Peak Period Pricing for Logan Airport

Assisted the Massachusetts Port Authority in developing a new pricing structure for Logan Airport. Analyzed annual, seasonal, weekly and daily demand at Logan to recommend the designated peak periods for rate-setting purposes. Supported the fee-setting analysis and projections

of impacts on operator schedules. Conducted simulation studies to estimate the aircraft delays under existing conditions and under the proposed peak period pricing system.

Computer Based Planning Tools

Supervises FTA's computer model development. Major development efforts include: Delay Simulation (DELAYSIM), a unique model which uses actual weather patterns, runway configuration capacities and demand forecasts to project how air traffic controllers would use runways and the resulting delays; Flexible Airport Simulation (FLAPS), a detailed model of runway operations for capacity and delay analyses; Taxiway Simulation (TAXSIM), which models the aircraft movements on the airport surface; Terminal Airspace Simulation (TASIM), which simulates air traffic within the terminal area; Competitive Airline Simulation System (CASS), a simulation of the airline industry.

Other

Mr. Hoffman has a broad range of other aviation consulting experience, including flight evaluation programs, and general aviation flight training syllabi. He holds a commercial pilots license, a flight instructor certificate, and has logged over 2000 hours of flight time. He has been appointed to AIAA and RTCA technical panels, and has prepared numerous professional publications.



Memorandum

Date: February 17, 2010

To: Massachusetts Port Authority

From: Michael A. Kenney and Wayne Arner, KB Environmental Sciences, Inc.

Subject: Boston-Logan International Airport Deicing Pad Air Emissions Inventory

Scope

At the request of the Massachusetts Port Authority (“Massport”), KB Environmental Sciences, Inc. (“KBE”) performed an assessment to estimate the amounts of greenhouse gases (“GHGs”) and other criteria air pollutants under the federal Clean Air Act that would be attributable to aircraft using a centralized deicing pad at Boston’s Logan International Airport (“Logan”) to comply with the United States Environmental Protection Agency’s (“EPA’s”) proposed Effluent Limitations Guidelines and New Source Performance Standards for the Airport Deicing Category¹ (the “Proposed Rule”). The results of this assessment are contained in Table 1 in the form of an emissions inventory.

Source Data, Assumptions and Methodology

KBE used the following source data, assumptions and methodologies in its assessment:

- KBE assumed that all aircraft departing Logan during weather conditions requiring deicing would have to taxi to and from and be deiced at the Expanded Juliet Pad, as that hypothetical facility is described in CH₂M HILL’s February 2010 technical memorandum entitled “Analysis of Centralized Deicing Pad Feasibility at Logan International Airport.”²
- KBE performed the assessment in accordance with the guidelines for assessing aircraft engine emissions contained in the FAA’s *Air Quality Procedures for Civilian Airports and Air Force Bases*.³

¹ EPA–HQ–OW–2004–0038 FRL–8948–2, 74 Fed. Reg. 44,676 (Aug. 28, 2009).

² It is KBE’s understanding that Massport intends to submit this technical memorandum with its comments on the Proposed Rule, to be included as part of the administrative record.

³ This FAA guidance document is available on the FAA web site at http://www.faa.gov/regulations_policies/policy_guidance/envir_policy/airquality_handbook/media/Handbook.PDF

- KBE utilized the most recent version of the FAA's Emissions and Dispersion Modeling System (EDMS v5.1.2) for its EPA criteria pollutant analysis.
- For its GHG analysis, KBE utilized methodologies contained in the *Airport Cooperative Research Program (ACRP) Report 11: Guidebook on Preparing Airport Greenhouse Gas Emissions Inventories*.⁴
- KBE used the aircraft fleet mix data presented in the *Logan 2008 Environmental Data Report* ("EDR").⁵
- The aircraft operations and incremental aircraft taxi and queue times used in the assessment were provided by Simat, Helliesen, and Eisner, Inc. ("SH&E"), a leading aviation management consulting firm engaged by Massport. These data are provided in **Attachment A** to this memorandum.
- KBE used SH&E's definition of "deicing season" as October 1 to March 31.
- KBE did not try to estimate potential air emissions from aircraft auxiliary power units and ground support equipment (e.g., mobile deicing vehicles) associated with the use of the hypothetical Expanded Juliet Pad.

Specifically, KBE combined the supporting data and information provided by Massport and SH&E with appropriate fuel utilization rates and GHG and criteria pollutant emission factors. KBE's calculations are provided in **Attachment B** to this memorandum.

The results of KBE's assessment are presented below in Table 1 and are expressed in units of tons per deicing season both for GHGs (carbon dioxide ("CO₂"), methane ("CH₄"), nitrous oxide ("N₂O") and carbon dioxide equivalents ("CO_{2e}") and for the EPA criteria pollutants (and their precursors) (carbon monoxide ("CO"), nitrogen oxides ("NO_x"), sulfur dioxide ("SO₂"), particulate matter ("PM_{10/2.5}") and volatile organic compounds ("VOCs").

Results

The air emissions inventory presented in Table 1 shows the estimated increases in emissions of GHGs and other EPA criteria air pollutants (in additional tons emitted per deicing season) that would be expected if all aircraft departing Logan during deicing

⁴ This guidance document, prepared by the National Research Council Transportation Research Board's ("TRB's") Airport Cooperative Research Program, is available on the TRB web site at http://onlinepubs.trb.org/onlinepubs/acrp/acrp_rpt_011.pdf.

⁵ This report, which Massport issued on September 30, 2009, is available on Massport's web site at <http://www.massport.com/about/pdf/2008EDR.pdf>.

conditions were required to use the hypothetical Expanded Juliet Pad for deicing. More specifically, the results are reported for the EPA criteria pollutants and GHGs under the forecasted 2010 and 2020 “Low” and “High” utilization scenarios.

Table 1. Deicing Pad Emissions Results

Scenario	Emissions (tons/deicing season)								
	EPA “Criteria” Pollutants					Greenhouse Gases			
	CO	NO _x	SO ₂	PM _{10/2.5}	VOC	CO ₂	N ₂ O	CH ₄	CO _{2e}
2010 Low	26	5	1	0.1	3	3,562	23	3	3,588
“ High	63	13	4	0.4	7	8,440	55	6	8,502
2020 Low	46	9	3	0.3	5	6,197	40	5	6,243
“ High	126	26	7	1	13	16,811	110	12	16,933

CO – carbon monoxide, NO_x – nitrogen oxides, PM_{10/2.5} – particulate matter 10 and 2.5 microns, VOC – volatile organic compounds, CO₂ – carbon dioxide, N₂O – nitrous oxide, CH₄ – methane, CO_{2e} – greenhouse gases as carbon dioxide equivalents.

In general, these values indicate that the use of the hypothetical Expanded Juliet Pad for compliance with the Proposed Rule would result in a <1 percent to 5 percent increase in the amounts of GHGs and other EPA criteria air pollutants emitted at Logan during a deicing season, in relation to the current levels of such emissions (as presented in the 2008 EDR air emissions inventory), depending on the pollutant, year (2010 or 2020) and scenario (Low or High).

To further put the increase in emissions in perspective, the increase in GHG (CO_{2e}) associated with the use of a centralized deicing pad is approximately equivalent to that emitted by 1,630 to 7,700 vehicles per deicing season day (depending on year and scenario, and assuming each vehicle travels 30 miles per day). Also, the increase in GHG is approximately equivalent to that emitted by 1,300 to 6,300 Boeing B747 takeoffs per deicing season (again, depending on year and scenario).

Relevant Experience of KBE

The resumes of Michael A. Kenney and Wayne Arner are provided in **Attachment C**.

Attachment A

Incremental Delays Due to Use of Pad Juliet for De-Icing at Logan International Airport

High: Pad Juliet Throughput of 27 Aircraft Per Hour

Deicing Season 2010 and 2020

Segment	Aircraft Class	Base Year 2010					Forecast 2020				
		Total Aircraft De-iced	Incremental Taxi Time (Hrs)	Total Aircraft Queuing	Queuing Time (Hrs)	Total Delay (Hrs)	Total Aircraft De-iced	Incremental Taxi Time (Hrs)	Total Aircraft Queuing	Queuing Time (Hrs)	Total Delay (Hrs)
Sched Psgr	RJ/Turboprop	2,060	206.0	1,060	644.8	850.8	2,410	241.0	1,240	1,481.8	1,722.8
Sched Psgr	Narrowbody	3,231	344.6	1,662	1,011.1	1,355.7	3,781	403.3	1,946	2,325.5	2,728.8
Sched Psgr	Widebody	606	87.9	312	189.8	277.7	709	102.8	365	436.2	539.0
Cargo	Widebody	121	12.5	62	37.7	50.2	142	14.7	73	87.2	101.9
GA	Business Jet	175	26.8	90	54.8	81.6	205	31.4	106	126.7	158.1
Total/Avg		6,193	677.8	3,186	1,938.2	2,616.0	7,247	793.2	3,730	4,457.4	5,250.6

Low: Pad Juliet Throughput of 36 Aircraft Per Hour

Segment	Aircraft Class	Base Year 2010					Forecast 2020				
		Total Aircraft De-iced	Incremental Taxi Time (Hrs)	Total Aircraft Queuing	Queuing Time (Hrs)	Total Delay (Hrs)	Total Aircraft De-iced	Incremental Taxi Time (Hrs)	Total Aircraft Queuing	Queuing Time (Hrs)	Total Delay (Hrs)
Sched Psgr	RJ/Turboprop	2,060	206.0	1,060	132.5	338.5	2,410	241.0	1,240	367.9	608.9
Sched Psgr	Narrowbody	3,231	344.6	1,662	207.8	552.4	3,781	403.3	1,946	577.3	980.6
Sched Psgr	Widebody	606	87.9	312	39.0	126.9	709	102.8	365	108.3	211.1
Cargo	Widebody	121	12.5	62	7.8	20.3	142	14.7	73	21.7	36.3
GA	Business Jet	175	26.8	90	11.3	38.1	205	31.4	106	31.4	62.9
Total/Avg		6,193	677.8	3,186	398.3	1,076.1	7,247	793.2	3,730	1,106.6	1,899.8

Note: Deicing season defined as October 1 to March 31.

Source: SH&E Analysis

Attachment B

2010 Low Scenario

Source	Fuel	Usage		CO2			N2O			CH4		
		Usage	Units	CO2 EF	Units	Emissions	N2O EF	Units	Emissions	CH4 EF	Units	Emissions
Aircraft Taxi	Jet A	336,027	gallons	21.095	lb/gallon	3,544	0.000463	lb/gallon	0.08	0.000595	lb/gallon	0.10
Aircraft Taxi	AvGas	1,969	gallons	18.355	lb/gallon	18	0.000243	lb/gallon	0.00	0.0155	lb/gallon	0.02

CO2	N2O	CH4	
MMTCO2E	MMTCO2E	MMTCO2E	MMTCO2E
0.0032153	0.0000210	0.0000023	0.0032386
0.0000164	0.0000001	0.0000003	0.0000168

metric tons	3,232	21	3	3,255
short tons	3,562	23	3	3,588

2010 High Scenario

Source	Fuel	Usage		CO2			N2O			CH4		
		Usage	Units	CO2 EF	Units	Emissions	N2O EF	Units	Emissions	CH4 EF	Units	Emissions
Aircraft Taxi	Jet A	798,516	gallons	21.095	lb/gallon	8,422	0.000463	lb/gallon	0.18	0.000595	lb/gallon	0.24
Aircraft Taxi	AvGas	1,969	gallons	18.355	lb/gallon	18	0.000243	lb/gallon	0.00	0.0155	lb/gallon	0.02

CO2	N2O	CH4	
MMTCO2E	MMTCO2E	MMTCO2E	MMTCO2E
0.0076406	0.0000500	0.0000054	0.0076960
0.0000164	0.0000001	0.0000003	0.0000168

metric tons	7,657	50	6	7,713
short tons	8,440	55	6	8,502

2020 Low Scenario

Source	Fuel	Usage		CO2			N2O			CH4		
		Usage	Units	CO2 EF	Units	Emissions	N2O EF	Units	Emissions	CH4 EF	Units	Emissions
Aircraft Taxi	Jet A	585,861	gallons	21.095	lb/gallon	6,179	0.000463	lb/gallon	0.14	0.000595	lb/gallon	0.17
Aircraft Taxi	AvGas	1,969	gallons	18.355	lb/gallon	18	0.000243	lb/gallon	0.00	0.0155	lb/gallon	0.02

CO2	N2O	CH4	
MMTCO2E	MMTCO2E	MMTCO2E	MMTCO2E
0.0056058	0.0000367	0.0000040	0.0056464
0.0000164	0.0000001	0.0000003	0.0000168

metric tons	5,622	37	4	5,663
short tons	6,197	40	5	6,243

2020 High Scenario

Source	Fuel	Usage		CO2			N2O			CH4		
		Usage	Units	CO2 EF	Units	Emissions	N2O EF	Units	Emissions	CH4 EF	Units	Emissions
Aircraft Taxi	Jet A	1,592,080	gallons	21.095	lb/gallon	16,792	0.000463	lb/gallon	0.37	0.000595	lb/gallon	0.47
Aircraft Taxi	AvGas	1,969	gallons	18.355	lb/gallon	18	0.000243	lb/gallon	0.00	0.0155	lb/gallon	0.02

CO2	N2O	CH4	
MMTCO2E	MMTCO2E	MMTCO2E	MMTCO2E
0.0152339	0.0000996	0.0000107	0.0153442
0.0000164	0.0000001	0.0000003	0.0000168

metric tons	15,250	100	11	15,361
short tons	16,811	110	12	16,933

Notes: Fuel usage obtained from EDMS v5.1.2. Emission factors (EF) were obtained from the Energy Information Administration website at <http://www.eia.doe.gov/oiaf/1605/coefficients.html>. MMTCO2E means million metric tons per year of CO2 equivalent.

Source: KB Environmental Sciences, Inc.

Attachment C

MICHAEL A. KENNEY

AIR QUALITY & ENVIRONMENTAL SCIENTIST

KB ENVIRONMENTAL SCIENCES, INC.



Expertise

Air quality, hazardous materials and industrial hygiene assessments for transportation-related facilities including airports, marine ports and roadways.

Education

BA / 1976 / Environmental Science / University of Maine

MS / 1979 / Environmental Engineering Sciences / University of Florida

Post-Graduate Studies / 1987-93 / Industrial Hygiene and Environmental Health / University of South Florida

Registrations / Certifications

1994 / Certified Hazardous Materials Manager, CHMM No. 5503

1995 / Qualified Environmental Professional, QEP No. 06930024

2003 / Certified Industrial Hygienist, CIH No. 8719

Experience

27 years - Private Consulting & Public Regulatory Agency

Mr. Kenney is Vice President of KB Environmental Sciences Inc. and has provided project management as well as hands-on technical involvement for a variety of assignments at airports and airway facilities. His air quality experience includes testing, dispersion modeling and analysis of stationary and mobile sources of outdoor air pollution. His hazardous materials experience includes environmental site assessments, contamination assessments/remediation and management plans for hazardous materials. Industrial hygiene experience includes indoor air quality and worker exposure surveys. Clients include commercial and general aviation airports, seaports, military installations, and a wide variety of other public- and private sector assignments throughout the United States and around the world.

Representative Projects & Services

T.F. Green State Airport, Providence, Rhode Island. As a sub-contractor to VHB, serves as the Technical Manager on the air quality impact assessment for proposed airport and terminal area improvement projects. More recently involved with RIAC in the coordination and development on the Long-term Air Monitoring Plan at PVD. Also prepared emissions inventories for all five RIAC airports in support of the new State Implementation Plan.

Baltimore Washington Thurgood Marshall International Airport, Baltimore Maryland. Project Manager for the first greenhouse gas (GHG) emissions inventory for BWI. Involved the identification, characterization and quantification of both “direct” and “indirect” GHG emission sources; comparison to other GHG sources state-, nation- and world-wide; and an overview of climate-based legislation and guidelines relevant to the aviation industry. This initial initiative will serve as the basis for future carbon reduction measures at the airport.

Logan International Airport, Boston, Massachusetts. Project Manager responsible for the air quality analyses for a new midfield taxiway, new commuter/general aviation runway, and new airfield operational procedures. Involved extensive atmospheric dispersion modeling and other technical air quality matters (monitoring, mitigation, etc.). As a sub-contractor to VHB, also responsible for the development of the Logan Air Quality Initiative and annual Environmental Data Reports – a multi-faceted management and mitigation plan for air quality.

Federal Aviation Administration, Washington, D.C. Project Manager responsible for the updating the “*Airport Air Quality Handbook*” used nationwide for airport air quality assessments. Also served as Project Manager for the development of the FAA’s “*Guidance Materials for the Assessment of Hazardous Air Pollutants*” from airports. Both publications involved extensive technical work and coordination with agency personnel.

Los Angeles International Airport, Los Angeles, California. Involved in comprehensive air quality impact assessment of planned master plan improvements. Key issues included hazardous air pollutants, dispersion modeling, and agency/ public coordination. Also serves as the Project Manager for preparation of the LAX Mitigation Plan for Air Quality.

Dallas/Fort Worth International Airport, Dallas, Texas. Task Manager for air quality impact assessment for the environmental impact statement for two proposed new runways and related actions. Included air quality monitoring of aircraft exhaust at various locations in the airport vicinity as well as monitoring of motor vehicle emissions in the landside terminal areas. Also responsible for the assessment of construction emissions and mitigation.

Dulles International Airport, Northern Virginia. Task Manager for air quality impact assessment for the environmental impact statement for the new airport master plan. Involved extensive agency coordination, emissions inventories, and dispersion modeling of operational and construction emissions.

Piedmont Triad International Airport, Greensboro, North Carolina. Air Quality Task Manager for preparation of an environmental impact statement for an airport expansion program. Key issues include general and transportation conformity, dispersion modeling, and a state Transportation Facility Permit.

New Denver International Airport, Colorado. Air quality impact assessment and air emission dispersion modeling to meet environmental impact statement requirements. Involved significant interface with the Colorado Department of Health and the Denver Area Council of Governments.

New Hong Kong Airport, Hong Kong. Comprehensive air quality impact assessment and atmospheric dispersion modeling of both construction- and operational-related emissions associated with the new airport development plan and environmental impact evaluation. Resulted in the approval of the environmental assessment report.

Expertise

Air quality analysis for air transportation projects and facilities with an emphasis on aircraft ground support equipment (GSE) and auxiliary power units (APUs).

Education

BS / 1999 / Environmental Engineering / University of Central Florida
MS / 2006 / Environmental Engineering / University of Central Florida

Registrations / Certifications

1999 / Engineer Intern, EI No. 1100005300

Experience

10 years – Consulting

Mr. Arner has served as technical analyst on numerous environmental studies for the air transportation industry. He has experience in conducting air emissions inventories, dispersion modeling, preparing reports on potential air quality impacts, and conducting research on airport air quality issues. Particular experience includes conducting airport ground service equipment (GSE) inventories and time-in-mode surveys, and developing guidelines for estimating GSE-related air emissions. Experience with computer simulation models includes the Federal Aviation Administration's (FAA) Emissions and Dispersion Modeling System (EDMS).

Representative Airport Air Quality Projects

Logan International Airport, Boston, MA. – Working with Massport staff, successfully completed emissions modeling for the annual Environmental Data Report (EDR) prepared for this airport. Includes full assessment of aircraft, GSE, APU, fuel facilities, motor vehicles and a variety of stationary sources of air emissions. Mitigation measures are also identified and quantified.

ICAO/CAEP Airport Air Quality Emissions Guidance Manual - Contributor to this newly-released ICAO/CAEP publication. These guidelines are designed to unify the methods by which airport-related emissions are computed world-wide. They include a methodology, emission factors and other technical guidance for the assessment of airport-related green-house gases (GHGs).

Federal Aviation Administration, Washington, D.C. – Contributor to a number of assignments in support of FAA air quality initiatives. These include the updating the "*Airport Air Quality Handbook*" used nationwide for airport air quality assessments and the development of the FAA's "*Guidance Materials for the Assessment of Hazardous Air Pollutants*" from airports.

Docket No. EPA-HQ-OW-2004-0038: Massachusetts Port Authority Comments
ANALYSIS OF EPA COST ESTIMATES FOR LOGAN

Introduction

The following tables summarize Logan's costs of compliance with EPA's Proposed Effluent Limitation Guidelines and Standards for the Airport Deicing Category at several airports as calculated by EPA. The tables indicate EPA's assumptions in developing projected costs, identify key inputs from Logan's response to EPA's Airport Deicing Questionnaire, and note missing data that may affect the projections provided.

Table 1 expands on the information available in "Table 11-15: Airport Deicing Cost Model Equations, Input Variables and Assumptions," provided in EPA's Technical Development Document for Proposed Effluent Limitation Guidelines and Standards for the Airport Deicing Category. Unless otherwise indicated, all citations in the table below refer to portions of the Technical Development Document. The table also utilizes information from EPA's "Cost Annualization Model" (EPA-HQ-OW-2004-0038-0634) and information provided by Logan Airport in response to EPA's Airport Deicing Questionnaire. These sources are also cited where relevant.

The table presents both the total and annualized costs of compliance at Logan as estimated by EPA. Totals represent the net present value of capital costs. EPA's methodology for annualizing costs is described in §11.3.4 of the Technical Development document. EPA assumed all airports would issue "tax exempt, fixed coupon rate serial General Airport Revenue Bonds (GARBs) to fund capital expenditures." EPA also assumed that airports will issue bonds equal to "the net present value of capital costs plus 3 percent to account for bond issuance costs." To arrive at annualized costs, EPA used the capital and operating maintenances costs from its cost model over 20 years, discounted future costs based on airport-specific opportunity costs of capital, and annualized costs to represent 20 equal annual payments. Logan's real bondrate is listed as 2.00 percent. The nominal bondrate for Logan is listed as 4.36 percent.

Table 2 summarizes and explains EPA's estimates for airfield deicing costs. These costs were included in the Agency's total annualized costs for each airport in Table 5-3 of the EPA Economic Analysis for the proposed guideline. A summary of the methodology used to determine the cost of compliance with the proposed airfield deicing guidelines is included in §11.4 of the Technical Development Document.

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ANALYSIS OF EPA COST ESTIMATES FOR LOGAN

Table 1. Aircraft Deicing Costs

Logan Cost Category	Logan Total (Not Annualized) Capital Costs (NPV)	Logan Annualized Capital Cost	Development Doc Equation	Inputs From Massport Questionnaire Answers	Logan Specific Inputs From Other Sources	Other Inputs	EPA Assumptions	Relevant Technical Development Document Section
Total Capital Costs	\$73,427,651	\$4,403,960	(Sum of below)				Figures reflect collection and treatment and do not include airfield deicing costs.	Table 11-1
Deicing Pad	\$23,904,619	\$1,433,724	Annual Aircraft Takeoffs (177,073) x Length of deicing season (5/12 th of year) x Normalized Capital Cost in \$/deicing season takeoffs (\$314.56)	Length of Deicing Season, Question 21: 5 months (5/12 th of year)	Annual aircraft departures from Bureau of Transportation Statistics (2002-2005) (Logan: 177,073)	Deicing pad installation costs from three airports (Table 11-5)	1. EPA obtained information on costs to install centralized deicing pads from three airports. 2. EPA normalized costs based on deicing season aircraft take-offs. Normalized capital cost = \$314.56 per deicing season takeoff. 3. EPA assumed a lifespan of 20 years for deicing pads and therefore did not include replacement costs (§11.3.4). (Note: EPA may have erroneously normalized to annual takeoffs instead of deicing season takeoffs.)	§11.3.2.1 at 11-16 Table 11-5 at 11-17 Table 11-15 at 11-33

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ANALYSIS OF EPA COST ESTIMATES FOR LOGAN

Logan Cost Category	Logan Total (Not Annualized) Capital Costs (NPV)	Logan Annualized Capital Cost	Development Doc Equation	Inputs From Massport Questionnaire Answers	Logan Specific Inputs From Other Sources	Other Inputs	EPA Assumptions	Relevant Technical Development Document Section
Storage Tank	\$2,412,299	\$144,682	Takeoffs (177,073) x storage tank capital cost in \$/gal (\$1.67) x storage tank volume per departure in gal/departure/yr (24) x scale (.33) (Not clear how scaling factor derived or why used.)	None	Annual Aircraft departures from Bureau of Transportation Statistics (Average 2002-2005) (Logan: 177,073)	1. Tank Cost and volume data from 5 airports (Table 11-14) 2. Scaling figure: source unknown. Located at Cell CG2 on CstAnnual Spreadsheet	EPA obtained cost and tank volume data from 5 airports. EPA normalized tank volume to departures (based on 3 of 5 airports) This leads to figure of 24 gallons per departure/yr. EPA then normalized costs to tank volume (using a different set of 3 of the 5 airports). EPA's Cost Annualization Model Spreadsheet notes tank cost scaling factors (.33 and .66), but it is unclear how the factors were derived or applied.	§11.3.2.3 at 11-28 Table 11-14 at 11-28 Table 11-15 at 11-34

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ANALYSIS OF EPA COST ESTIMATES FOR LOGAN

Logan Cost Category	Logan Total (Not Annualized) Capital Costs (NPV)	Logan Annualized Capital Cost	Development Doc Equation	Inputs From Massport Questionnaire Answers	Logan Specific Inputs From Other Sources	Other Inputs	EPA Assumptions	Relevant Technical Development Document Section
Piping	\$517,437	\$31,034	Estimated costs for 1,000 linear feet of piping: (\$502,000) (See table 11-13 for details)	None	None	1. No variable inputs 2. See Table 11-13 for breakdown of estimated capital costs for 1,000 linear feet of stormwater piping obtained from RSMeans Heavy Construction Cost Data (2002) and escalated to 2006 dollars. Additional factors obtained from DoD MILCON estimating procedures.	1. EPA assumed all airports need to construct 1,000 linear feet of new subsurface storm water conveyance piping. 2. EPA calculated capital costs based on fixed amounts provided by various data sets.	§11.3.2.3 at 11-26 Table 11-13 at 11-27 Table 11-15 at 11-35

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ANALYSIS OF EPA COST ESTIMATES FOR LOGAN

Logan Cost Category	Logan Total (Not Annualized) Capital Costs (NPV)	Logan Annualized Capital Cost	Development Doc Equation	Inputs From Massport Questionnaire Answers	Logan Specific Inputs From Other Sources	Other Inputs	EPA Assumptions	Relevant Technical Development Document Section
AFBR Treatment	<p>\$45,795,136¹</p> <p>EPA appears to have made a math error. The number should be \$93,722,677, using 995,249 gals/yr ADF use and 152 deicing days/yr (5/12 of 365).</p>	<p>\$2,746,649</p> <p>Reflects the math error in calculating the total capital cost.</p>	<p>ADF use per season x COD in lbs/gal ADF (14.38) x collection % (.6) x 1/operating period in days x COD load-normalized capital cost (\$/lbs COD/day: \$1,659).</p>	<p>Operating days from airport questionnaire based on length of deicing season (Logan indicated a 5 month season)</p>	<p>ADF use from airline detailed questionnaire: 995,249 gallons for Logan (see Table 10-2)</p>	<p>1. Data from two airports (Albany and Akron) 2. Pounds COD per gallons glycol conversion factor (14.38) 3. Target collection % (.6)</p>	<p>1. Two airports provided installed capital costs for AFB biological treatment systems. 2. EPA normalized capital costs for the two airports based on COD loading (lbs/day) = \$1,659 /lbs COD/day. 3. COD loading is calculated by converting applied ADF (gal/yr) to lbs COD /yr 4. Collection efficiency assumed based on selected technology (e.g.: 60% for deicing pad). 5. The ADF usage data from the airline questionnaire was used to develop estimates of ADF use at particular airports. (§10.3.2)</p>	<p>§11.3.2.3 at 11-22</p> <p>Table 11-10 at 11-23</p> <p>Table 11-15 at 11-34</p> <p>§10.3.2 at 10-8</p> <p>Table 10-2 at 10-9</p>

Docket No. EPA-HQ-OW-2004-0038: Massachusetts Port Authority Comments
ANALYSIS OF EPA COST ESTIMATES FOR LOGAN

Logan Cost Category	Logan Total (Not Annualized) Capital Costs (NPV)	Logan Annualized Capital Cost	Development Doc Equation	Inputs From Massport Questionnaire Answers	Logan Specific Inputs From Other Sources	Other Inputs	EPA Assumptions	Relevant Technical Development Document Section
Monitoring	\$798,160	\$47,871	<p>Number of outfalls x number of deicing days/yr x normalized cost (\$3,911)</p> <p>Engineering: Number of outfalls x normalized cost (\$5,680)outfall</p>	<p>1. Number of outfalls: Question 11b (3)ⁱⁱ</p> <p>2. Number of deicing days: Question 20: Massport provided number of days as “unknown.”ⁱⁱⁱ</p>	None	<p>Cost data based on professional judgment and EPA Memorandum: <i>Estimated Costs for Initial Monitoring, Engineering Assessment and SWPPP Updates for Airports</i> (2008)</p>	<p>1. EPA estimated labor hours for sample plan development and sample collection, determined vendor costs for collection and flow measurement, and obtained units costs from environmental laboratories for sample analysis. Specifics are included in a memorandum titled <i>Estimated Costs for Initial Monitoring, Engineering Assessment and SWPPP Updates for Airports</i> (2008).</p> <p>2. EPA developed equation on a per outfall and deicing days basis using a surrogate airport.</p> <p>3. EPA assumed labor costs of \$85/hr and costs of \$5,680 per outfall.</p>	§ 11.3.2.1 at 11-13.

Docket No. EPA–HQ–OW–2004–0038: Massachusetts Port Authority Comments
ANALYSIS OF EPA COST ESTIMATES FOR LOGAN

Logan Cost Category	Logan Total (Not Annualized) Capital Costs (NPV)	Logan Annualized Capital Cost	Development Doc Equation	Inputs From Massport Questionnaire Answers	Logan Specific Inputs From Other Sources	Other Inputs	EPA Assumptions	Relevant Technical Development Document Section
Annual O&M Costs	N/A	\$5, 140, 270	(Sum of Category)					
Deicing Pad	N/A	\$654,432	Deicing Season Aircraft Takeoffs (177,073) x Length of deicing season (5/12 th of year) x Normalized O&M Cost (\$8.87)	Length of Deicing Season, Question 21: 5 months (5/12 th of year)	Annual Aircraft departures from Bureau of Transportation Statistics (2002-2005) (Logan: 177,073)	Block and pump O&M data from 1 airport.	1. EPA could not obtain O&M data for deicing pads. Instead, it relied on block-and-pump O&M data from General Mitchell International Airport (Milwaukee) and subtracted rental costs for temporary storage tanks, arriving at a cost of \$8.87/departure. 2. EPA assumed underground storage system has sufficient capacity to contain major storm events.	§11.3.2.1 Table 11.5 Table 11-15 at 11-33

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ANALYSIS OF EPA COST ESTIMATES FOR LOGAN

Logan Cost Category	Logan Total (Not Annualized) Capital Costs (NPV)	Logan Annualized Capital Cost	Development Doc Equation	Inputs From Massport Questionnaire Answers	Logan Specific Inputs From Other Sources	Other Inputs	EPA Assumptions	Relevant Technical Development Document Section
Storage Tank	N/A	\$104,597	Takeoffs (177,073) x normalized annual O&M cost in \$/departure/yr (\$1.79) x scale (.33)	None	Annual aircraft departures from Bureau of Transportation Statistics (Logan: 177,073)	1. Data on O&M costs from 1 airport 2. Scaling figure: source unknown. Located at Cell CG2 on CstAnnual Spreadsheet	EPA only received O&M cost data from one airport with O&M costs ranging from \$50,000-\$100,000 a year. EPA normalized this amount to the departures/yr at that airport to arrive at the annual O&M Cost (\$1.79). EPA's Cost Annualization Model Spreadsheet provides Tank Cost Scales. We have been unable to determine the source of the scaling..	§11.3.2.3 at 11-28 Table 11-15 at 11-34

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ANALYSIS OF EPA COST ESTIMATES FOR LOGAN

Logan Cost Category	Logan Total (Not Annualized) Capital Costs (NPV)	Logan Annualized Capital Cost	Development Doc Equation	Inputs From Massport Questionnaire Answers	Logan Specific Inputs From Other Sources	Other Inputs	EPA Assumptions	Relevant Technical Development Document Section
Piping	N/A	Not calculated for Logan	<p>Total: Labor+Electrical Costs</p> <p>Labor Cost: number of deicing days//yr x 24hrs x hourly rate (\$32)</p> <p>Electrical Cost: Horsepower (40) x. kW (.7456) x number of deicing days/yr x24 hours x .07 (average electrical rate from airport questionnaire)</p>	<p>1. Number of deicing days: Question 20: Massport provided number of days as “unknown.”</p> <p>2. Average hourly labor rate: Massport did not provide.</p> <p>3. Average electrical rate: Massport did not provide.</p>	None	<p>1. Average hourly labor rate: average from airport questionnaire.</p> <p>2. Average hourly electrical rate from questionnaire.</p> <p>3. Overall capital costs (\$502,000)(to calculate annual replacement part costs)</p>	<p>1. One operator would monitor piping system during each deicing day.</p> <p>2. Average hourly rate is \$32/hr.</p> <p>3. Electrical costs: one 40 horsepower pump to operate in lift state at costs of \$.07/kWh based on number of deicing days.</p> <p>4. Electrical and labor rates obtained from average of questionnaire responses.</p> <p>5. Maintenance Equipment Costs: Perry’s Chemical Engineer’s Handbook (1984) suggests annual replacement parts of 6% of capital cost (\$8,300/yr).</p>	<p>§11.3.2.3 at 11-26</p> <p>Table 11-15 at 11-35</p>

Docket No. EPA-HQ-OW-2004-0038: Massachusetts Port Authority Comments
ANALYSIS OF EPA COST ESTIMATES FOR LOGAN

Logan Cost Category	Logan Total (Not Annualized) Capital Costs (NPV)	Logan Annualized Capital Cost	Development Doc Equation	Inputs From Massport Questionnaire Answers	Logan Specific Inputs From Other Sources	Other Inputs	EPA Assumptions	Relevant Technical Development Document Section
AFBR Treatment	N/A	\$4,381,241	$\text{ADF use per season} \times \text{lbs COD per gal glycol (14.38)} \times \text{collection \% (.6)} \times \frac{1}{\text{operating period in days}} \times \text{COD load-normalized annual O\&M cost (\$/lbs COD/day: \$77.72)}$	1. Operating days from Airport questionnaire based on length of deicing season (Logan indicated a 5 month season, roughly 150 days)?	1. ADF use from airline detailed questionnaire (995,249 gallons for Logan) (?)	1. Data from two airports 2. Conversion factor for gallons of glycol to pounds COD (14.38) 3. Target collection % (.6)	1. EPA obtained O&M costs for AFB biological treatment systems from 2 airports (Albany and Akron). 2. EPA normalized this data based on COD load using same methodology used to calculate AFB capital costs and arrived at a COD Load-Normalized Annual O&M Cost of \$77.72 measured in \$/yr/lbs/day). 3. The ADF usage data from the Airline questionnaire was used to develop estimates of ADF use at particular airports. (§10.3.2).	§11.3.2.3 at 11-22 Table 11-11 at 11-23 Table 11-15 at 11-34 §10.3.2 at 10-8 Table 10-2 at 10-9.

Docket No. EPA-HQ-OW-2004-0038: Massachusetts Port Authority Comments
ANALYSIS OF EPA COST ESTIMATES FOR LOGAN

Logan Cost Category	Logan Total (Not Annualized) Capital Costs (NPV)	Logan Annualized Capital Cost	Development Doc Equation	Inputs From Massport Questionnaire Answers	Logan Specific Inputs From Other Sources	Other Inputs	EPA Assumptions	Relevant Technical Development Document Section
Monitoring	N/A	\$0	None	None	None	None	EPA development document and data sets only include analysis of one-time monitoring and engineering costs for the purpose of selecting appropriate technologies. Annual monitoring costs are therefore \$0 for all airports.	§11.3.2.1
Total Annual Cost		\$9,544,232	(Sum of Annual O&M and Capital Costs)				Does not include airfield de-icing costs (See table 2)	

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ANALYSIS OF EPA COST ESTIMATES FOR LOGAN

Table 2: Airfield Deicing Costs

Logan Cost Category	Logan Annual Costs	Development Doc Equation	Key Inputs From Massport Questionnaire Answers	Other Inputs	EPA Assumptions	Relevant Technical Development Document Section
Incremental Cost to Change from Urea to Potassium Acetate	\$3,040 ^{iv}	<p>Predicted Potassium Acetate Cost (\$/yr 2006)- Estimated Actual Annual Urea Cost (\$/yr 2006)</p> <p>(Both equations rely on data inputs explained in columns to the right)</p>	<p>1. Airfield Deicing Area^v</p> <p>2. Number of outfalls: Question 11b (3)ⁱⁱ</p>	<p>1. Average Urea and Liquid Potassium Acetate Costs (Table 11-16) based on information obtained from eight airports)</p> <p>2. Typical application rates for Potassium Acetate/1,000ft² (Tables 11-17, 11-18).</p> <p>3. Statistical Airport weighting values (Logan 1.0)</p> <p>3. Cost per 1000 square feet: \$1.17-\$1.46 for potassium acetate.</p>	<p>1. EPA Could not obtain actual application rates for potassium acetate at individual airports. It instead obtained sodium acetate rates and assumed the amount of sodium acetate required to provide the same protection as urea is between 66 and 70 percent.</p> <p>2. Costs do not include capital costs for new equipment to change from solid form urea application to a liquid form of potassium acetate</p>	<p>1. §11.4: Airfield Deicing Costs</p> <p>2. EA Table 4:1- Identifying BAT Control Options with Airfield Deicing Options</p> <p>3. EA Table 5-3: Airport compliance Costs</p>

Docket No. EPA-HQ-OW-2004-0038: Massachusetts Port Authority Comments
ANALYSIS OF EPA COST ESTIMATES FOR LOGAN

Logan Cost Category	Logan Annual Costs	Development Doc Equation	Key Inputs From Massport Questionnaire Answers	Other Inputs	EPA Assumptions	Relevant Technical Development Document Section
Estimated Annual Costs for Airports to Conduct Effluent Monitoring Program for Urea Airfield Deicing	\$22,230	Monitoring Analytical Costs(\$/yr) (1 sample per day x number of outfalls (3) x26 weeks) + Monitoring Labor costs (1 hr. per sample) (\$/yr)	Number of outfalls: Question 11b (3) ⁱⁱ	1. \$24 in sampling costs per sample 2. \$33/hr in labor costs	1. EPA assumed some airports will continue to use at least some urea for pavement deicing instead of switching to potassium acetate. 2. Monitoring costs: One sample per day, per airport outfall for 26 weeks=130 samples per outfall. 3. Sample cost assumed to be \$24. 4. Labor: One hour per sample 5. Labor cost assumed to be \$33/hr.	§11.4
Total Annualized Cost (Economic Assessment)	\$9,569,474				Includes costs discussed in Table 1 as well as airfield deicing costs described in Table 2.	

ⁱ This figure should reflect collection of 60% of spent ADF. However, in the cost-annualization spreadsheet, the number given for 60% collection is the same as for 40% collection (which supports our theory that EPA made a math error).

ⁱⁱ Massport's questionnaire response indicates that an additional 44 outfalls are not included in the current NPDES permit but will be included in the final NPDES individual permit. Massport indicated it was unaware whether pavement deicing materials are discharged at these outfalls.

ⁱⁱⁱ Massport did indicate that there were 19 deicing/anti-icing events for the 20052006 season but also noted that snowfall was below average during that season.

^{iv} Table 11-20 indicates the Incremental Cost is \$3,000. However, this appears to be an error as the difference in costs between the two products is \$3,040.

^v It is not clear where EPA obtained this information. However, Massport does provide a catchment area for the three listed outfalls in response to Question 11e.

Water Quality Impacts of Deicing at Boston Logan International Airport

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September 30, 2009

Executive Summary

This report presents the results of the Logan Airport Water Quality Deicing Impacts Study that was conducted to satisfy the requirements in Section D.1, Water Quality Study, in National Pollutant Discharge Elimination System (NPDES) Permit No. MA0000787, issued to the Massachusetts Port Authority (Massport) and Co-Permittees of Boston Logan International Airport (Logan Airport) in 2007. The overall goal of the study was to conduct a “biological, chemical, and toxicological analysis of Logan Airport’s stormwater discharges and the resultant receiving water quality in order to characterize the impacts of deicer contained in stormwater discharges.” The permit language further relates the characterization of impacts to an assessment “of the ability of the receiving waters to meet their designated uses, including an assessment of impacts to aquatic life and fishing, shellfishing and recreation.” Based on the analyses conducted in this water quality study, the following conclusions were reached:

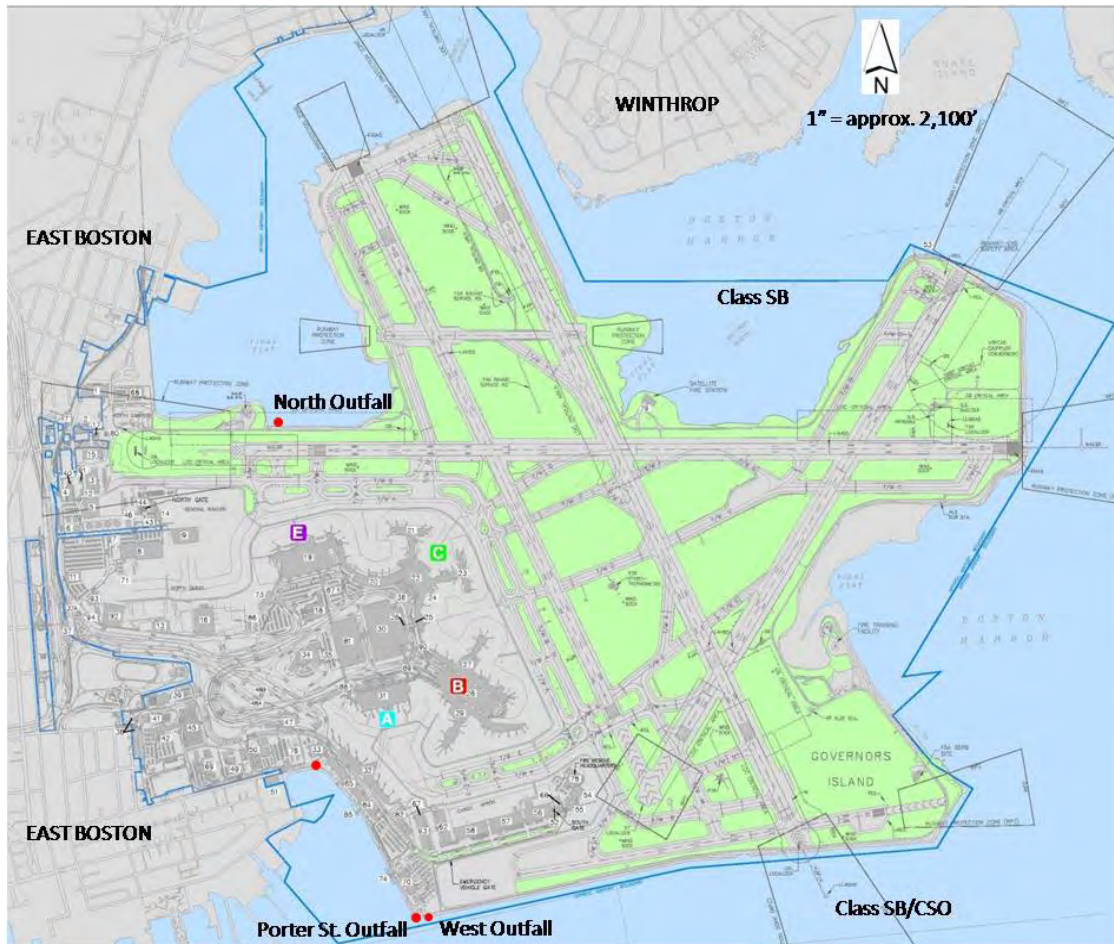
- The discharge of stormwaters containing deicing materials does not negatively impact receiving water dissolved oxygen concentrations;
- The stormwater discharges do not contain materials in concentrations in excess of established water quality criteria or available toxicity benchmarks; and
- Aquatic toxicity in the discharges does not adversely affect the designated uses (SB, SB/CSO) of the receiving waters.

Specific requirements of Section D.1 and the measures and analyses that Massport undertook in the Water Quality Study to comply are summarized in Table ES-1 and discussed below.

Background

Logan Airport occupies approximately 1,750 acres of land in East Boston. The airport is surrounded on three sides by Boston Harbor (Figure ES-1).

FIGURE ES-1. LOCATION OF LOGAN INTERNATIONAL AIRPORT



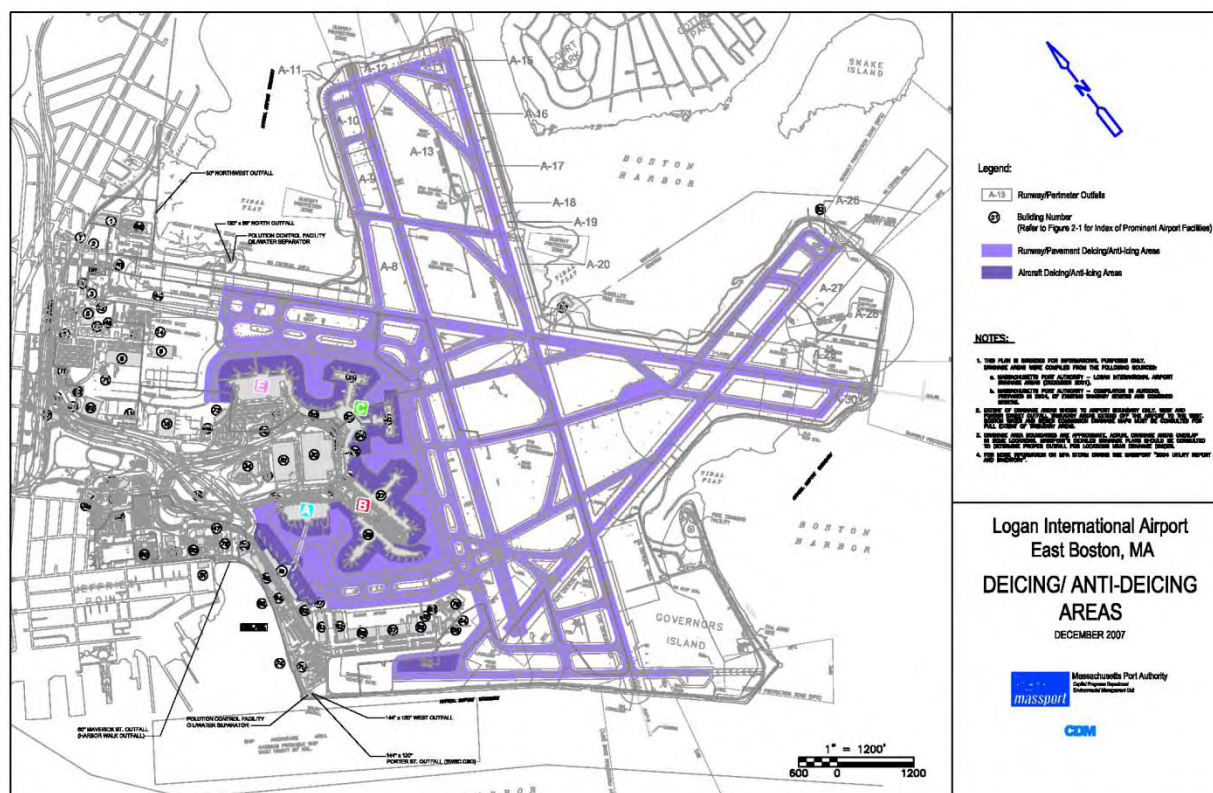
Conditions in Waters Surrounding Logan Airport

The waters surrounding Logan Airport are classified as SB on the northern side and SB/CSO to the south. The water quality standards for both classifications require that dissolved oxygen (DO) be no less than 5.0 milligrams per liter (mg/L). There is no evidence of water column DO concentrations falling below 5.0 mg/L during any of the deicing seasons over the 14-year period of record of the Massachusetts Water Resources Authority's (MWRA, 2008) monitoring program in the vicinity of Logan Airport (Figure 2-1). Similarly, historical receiving water data on nitrogen and ammonium concentrations show a classic estuarine pattern with no measurable impacts from deicing discharges. Boston Inner Harbor is listed as impaired for pathogens and priority organics in the State of Massachusetts' 305(b) and 303(d) listings for 2006, neither of which is related to deicing discharges.

Overview of Deicing Operations

Two types of deicing operations are conducted at Logan Airport: deicing of aircraft and deicing of paved areas, including the runways, taxiways, ramp areas, and roadways. Figure ES-2 shows where these types of deicing are generally conducted. The location of actual deicing activities, especially airfield pavement deicing, varies with operational and weather conditions specific to each deicing event.

FIGURE ES-2. LOCATION OF AIRCRAFT AND AIRFIELD PAVEMENT DEICING OPERATIONS AT LOGAN INTERNATIONAL AIRPORT



Aircraft deicing is conducted by either the airline or a contractor using Society of Automotive Engineers (SAE)-certified propylene glycol- or ethylene glycol-based Type I aircraft-deicing fluids (ADFs) and Type IV aircraft anti-icing fluids (AAFs). These operations are primarily

conducted at the aircraft gates, North and South Cargo ramps, and a deicing pad (the “Juliet” pad) in the southwest portion of the airport.

Massport is primarily responsible for pavement-deicing operations and snow removal on runways, taxiways, ramp areas, roadways, and public sidewalks. Some tenants conduct limited deicing of their own ramp areas. Airside (i.e., ramp areas, taxiways, and runways) deicing is conducted using SAE-certified pavement-deicing materials (PDMs). Liquid ethylene glycol/urea product is used as the primary airfield pavement deicing product. Infrequently, this liquid product is supplemented by a sodium acetate–based granular product. Landside deicing of public roadways and sidewalks are deiced using a combination of rock salt (sodium chloride), magnesium chloride, and sand. Impacts from landside deicing were not evaluated in this study.

Pathways for Deicing Discharges to Receiving Waters

The primary pathway for deicing runoff to reach surface waters is via the airport’s stormwater outfalls. More than 97 percent of aircraft deicer use occurs within the drainage areas of the North and West Outfalls. Airside pavement deicing is distributed among a combination of the North and West outfalls and 44 smaller outfalls that drain the runways and the perimeter area of the airport (outfalls A-1 through A-44).

Environmentally Relevant Characteristics of Deicing Products

There are two primary potential environmental impacts from aircraft and pavement deicing products: (1) oxygen demand, and (2) aquatic toxicity. All FAA approved deicing products are formulated with readily biodegradable freezing point depressants that contain relatively high biochemical oxygen demand (BOD) and contain either propylene or ethylene glycol. The PDMs used at Logan Airport contain ethylene glycol, urea, or sodium acetate. The ADFs and AAFs contain propylene or ethylene glycol. Proprietary additives required to meet the deicer specifications in ADFs and AAFs are the primary source of aquatic toxicity in the products. Historically, nonylphenol ethoxylate and tolyltriazoles have been identified as additives associated with aquatic toxicity. However, these additives are being phased out of the formulations. Further, the deicer specifications establishing performance standards also define maximum allowable fluid toxicity for Type 1 ADFs.

Overview of the Water Quality Study Process

Permit No. MA 0000787 was issued to Massachusetts Port Authority and the Co-Permittees of Logan International Airport on September 28, 2007. Milestones achieved and coordination activities undertaken by Massport to comply with Section D.1, Water Quality Study thus far include:

- Massport submitted a plan and schedule for the Water Quality Study to the U.S. Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection (MassDEP) for their review and comment in March 2008.
- Massport conducted a screening level assessment of deicer use, assimilative capacity of the receiving waters, and potential ecological risk to define the impact issues and requirements for additional data and analyses to complete the Water Quality Study. The results were reported in the *Water Quality Impacts of Deicing at Boston Logan*

International Airport Phase 1 Study Report (Massport 2008). The *Phase 1 Study* was submitted to EPA and MassDEP for review and comment.

- Massport presented a briefing on the findings of the *Phase 1 Study* and proposed data collection program for the 2008-2009 deicing season to EPA in the fall of 2008.
- Massport briefed EPA on the data collected during the 2008-2009 deicing season and proposed analyses for completion of the water quality study on June 24, 2009.

This report is being submitted to EPA and MassDEP in compliance with the permit provision that a water quality study report be submitted for review and comment within 24 months of the effective date of the permit.

Summary of the Phase 1 Water Quality Study

The intent of the Phase 1 study was not to precisely characterize impacts, but rather to divide potential impacts into two broad categories:

1. Potential impacts where the findings indicate no significant ecological risk. Based on conservative assumptions, these can be eliminated from further investigation with a high level of confidence;
2. Potential impacts where possible ecological risk was identified. In this case, it cannot be definitively concluded that an unacceptable ecological impact exists, only that further investigation is needed to evaluate the actual risk.

Phase 1 consisted of modeling to describe deicing discharges and the response of receiving waters to those discharges based on historical weather conditions. The Stormwater Management Model (SWMM) was applied in conjunction with the Aircraft Deicing Management Model (ADMM) to estimate flows, loads, and concentrations in deicing discharges. The CORMIX model was used to estimate concentrations of deicers in the receiving waters as a result of the flow and concentration characteristics defined by the airfield models. A Screening Level Ecological Risk Assessment (SLERA) that is consistent with U.S. EPA Ecological Risk Assessment guidance and the Massachusetts Contingency Plan was prepared based on the modeling results. Findings of the Phase 1 evaluations with respect to the potential sources of impact to the receiving waters were as follows:

- *Dissolved Oxygen*

The modeling analyses showed that DO concentrations in the receiving waters are well above the water quality standard (5.0 mg/L) and MWRA caution level (6.5 mg/L) and indicate no discernible adverse effects on DO from deicing discharges.

- *Toxicity of Deicers*

Potential toxicity was evaluated by comparing modeled deicer concentrations at each outfall (i.e., end of pipe) and at the edge of the mixing zone to conservative water quality benchmarks. These results indicated that further evaluation using site-specific discharge data and more sophisticated modeling of the receiving waters should be conducted.

- ***Nonylphenol and Tolyltriazoles***

Nonylphenol is a degradation product of nonylphenol ethoxylate, an additive that is used in some aircraft deicing and anti-icing products. Tolyltriazoles are another category of additives which may pose an unacceptable toxicity risk that were also detected in these same samples. Detailed logs of products used by carriers during the 2008–2009 deicing season confirm that ADFs and AAFs containing these products are being eliminated or phased out.

- ***Potential Airfield Pavement–Deicing Impacts***

The potential contribution of pavement deicing to the total BOD load in deicing discharges is orders of magnitude smaller than those for aircraft deicing, and was shown in Phase 1 to represent an insignificant impact to receiving waters. Similarly, nitrogen in discharges during a significant deicing event translate into very small increases in total nitrogen concentrations in receiving waters. As such, the data indicate that pavement-deicing discharges do not adversely contribute to nutrient load in the receiving waters.

Water Quality Impact of Deicing

The primary objective of the water quality study is to characterize stormwater discharges and resultant receiving water quality to determine whether the discharge of stormwater laden with deicer fluids from Logan International Airport prevents the receiving waters from achieving their designated uses. The designated uses are defined by the surface water classifications. Criteria for determining whether a water body supports its designated uses are presented in the *Assessment Methodology Guidelines for Evaluating Designated Use Status of Massachusetts Surface Waters—2007* (MassDEP 2007). The 2008-2009 deicing season monitoring program was conducted in accordance with the recommendation of the Phase 1 Study. The evaluation of effect of the stormwater discharges in receiving waters is in accordance with the MassDEP guidance.

Data Collection Program

The 2008-2009 deicing discharge monitoring effort built upon the basic compliance requirements in the NPDES permit to provide data required to support evaluation of potential water quality impacts from deicing discharges at Logan Airport. The principal elements of the data collection program were:

- Daily logging and tabulation of deicer use;
- Topographic survey of the tidal flats for use in dilution modeling at the North and A-21 Outfalls;
- Continuous monitoring of three outfalls (West, North, and A-21) for flow and other physical parameters;
- Monitoring of three storm events using hourly (or bi-hourly) grab sampling and analysis for chemical oxygen demand (COD), ethylene glycol, propylene glycol, ammonia, and total Kjeldahl nitrogen (TKN); and
- Whole Effluent (WET) aquatic toxicity tests at three outfalls and chemical analysis of the test media for the routine analytes and the ADF and AAF additives nonylphenol ethoxylate and tolyltriazole.

Characterization of Deicer Use

The Phase 1 study utilized the historical 95th percentile storm event deicer usage to assess potential impact of outfall releases on the receiving waters. The 2008/2009 season was modeled using ADMM and compared to model results for the 61-year meteorological period of record using the same flight schedule. Based on that analysis, each of the 2008-2009 monitored storms ranked higher than the 95th percentile in estimated ADF usage. We note that the model over-predicted the amount of ADF that would have been used during those monitored storm events. The model confirms, however, that the monitored storm events would be expected to fall within the 95th percentile of storms on the basis of ADF usage regardless of its over-prediction of the actual ADF usage for individual storm events. Since the actual measured storms fit the significance criterion for evaluation of water quality impact, water quality assessment is based on the actual water chemistry and toxicity data collected in the 2008-2009 monitoring program instead of simulating discharges by application of the ADMM and SWMM models.

Impact on Dissolved Oxygen in Receiving Waters

The Phase 1 Study included a conservative analysis of impact of deicer fluid oxygen demand on the receiving waters and indicated that the resulting ambient DO would be in the range of 7.5 to 8.5 mg/L and would be well above the MWRA caution level of 6.5 mg/L and state water quality standard of 5.0 mg/l. While it was determined that the analysis of DO for the West Outfall receiving waters as conducted in the Phase 1 Study was sufficient, a more detailed assessment of DO impacts in Winthrop Bay was conducted to better evaluate and understand the more restricted flushing in those waters. The model simulating impact of the COD and ammonia load from stormwater discharges in the North and A-21 Outfalls on the DO concentration in Winthrop Bay was run for up to 10 days. The results show that the DO depression is less than 1 mg/L at channel centerline and in no case resulted in a DO receiving water concentration below the MWRA caution level of 6.5 mg/L.

Impact of Ammonia Discharge on Receiving Water Quality

The toxicity of ammonia in surface waters varies with pH, temperature, and salinity. For conditions typical of the receiving waters during the deicing season (pH of 7-8, temperature of 0-10 degrees Celsius, and a salinity of 20-30 parts per thousand), ammonia nitrogen of 14 mg/L in the receiving water has the potential to exceed the acute criterion as defined in *Ambient Water Quality Criteria for Ammonia (Saltwater)* (U.S. EPA1989). The maximum concentration measured in the stormwater discharged from all outfalls was 11.2 mg/L while the median concentration of ammonia discharged from each of the three outfalls was 1.4 mg/l. Ammonia nitrogen discharged from the stormwater system does not adversely impact ambient water quality. 1.4 mg/l.

Impact of Tolyltriazole and Nonylphenols in Discharges on Receiving Water Quality

The National Ambient Water Quality Criteria (NAWQC) lists an acute criteria of 7.0 µg/L in saltwater for nonylphenol. Because the discharge of residual aircraft deicing fluids is an intermittent event related to storm events and results in a discharge into a tidally-fluctuating receiving water, potential exposures are short term. Thus, only the acute criterion is applicable under these exposure conditions in the Logan Airport receiving waters. The maximum concentration of nonylphenols in the discharge waters was 2.3 ug/l. A resultant Hazard Quotient

(HQ) is 0.33 indicating minimal potential for environmental impact (potential risk is indicated by an HQ greater than 1). Thus, nonylphenols in stormwater discharges at Logan Airport do not represent a potential for adverse impact to biota in the receiving waters.

There are no NAWQC criteria for tolyltriazoles. A toxicity benchmark of 470 µg/L was derived from available literature (Pillard et al. 2001). Total tolyltriazole concentrations reported for the Logan Airport bioassay test media in 2008-2009 ranged from 12.2 to 68 µg/L. A resultant HQ is 0.15. Since potential risk is indicated by an HQ greater than 1, tolyltriazoles in stormwater discharges at Logan Airport do not represent a potential for adverse impact to biota in the receiving waters.

Potential for Impact to Aquatic Life as Determined in Whole Effluent Testing (WET)

Potential toxicity from deicers was also evaluated using EPA WET testing. Massachusetts defines the acute criterion for assessing whether waters support or impair designated use for aquatic life as 75 percent survival after 48 hours of exposure to the ambient surface waters. The acute toxicity tests for *Menidia beryllina* and *Mysidopsis bahia* (*Americamysis bahia*) that met all criteria for usability had 100 percent survival in the undiluted discharge water after 48 hours of exposure. These tests were conducted on representative samples of discharge waters from the North, West, and A21 outfalls and were initiated within the required sample holding time. Eight additional toxicity tests were conducted on media collected within the drainage system that were not representative of discharges to the receiving water or were limited by nonconformance to testing protocol for holding time. In seven of the eight tests where data usability limitations were identified, a dilution of less than 3.5 was sufficient to meet the 48-hour survival criterion. Analysis of mixing conditions upon discharge indicate that organisms are not be exposed to undiluted discharge water for even as long as six hours. Thus, the discharges would not adversely impact aquatic life in the receiving waters and are predicted to meet the criteria established by Massachusetts for support of designated uses.

Assessment of the Extent and Duration of Exposure of Aquatic Biota to Stormwater Discharges

In order to examine discharge plume characteristics associated with deicing events, dilution models sanctioned by EPA or the US Army Corps of Engineers were applied to the North, A21, and West Outfalls. The North and A21 Outfalls are adjacent to tidal flats. At low water a flow channel crosses the tidal flat and limited dilution occurs until the effluent reaches deeper water or the incoming tide provides dilution. Each of the outfalls is regulated by tide gates which restrict discharge to the ebbing portion of the tidal cycle. Two dimensional (2-D) and three-dimensional (3-D) hydrodynamic models were used to provide a more realistic representation of the fate of discharges. A 2-D hydrodynamic model was used at the North and A21 Outfalls. A 3-D hydrodynamic model was used at the West Outfall, which is adjacent to the deeper Boston Harbor Channel. In both the 2-D and 3-D models a time-series of tide elevations and discharge flows are input and the model calculation steps through several tidal cycles. The maximum areas exposed to less than twofold dilution, less than fivefold dilution, and the total duration of exposure to a detectable plume from the discharge are summarized below:

Outfall	Area Exposed to Less than Twofold Dilution	Area Exposed to less than Fivefold Dilution	Total Site-Specific Duration of Exposure to a Detectable Plume
North Outfall	8 acres	13 acres	Less than 6 hours
A-21 Outfall	4 acres	7 acres	Less than 6 hours
West Outfall	0.3 acres	5 acres	Less than 1 hour

The results of the dilution modeling clearly show that exposure to discharges from the Logan Airport stormwater system are limited in extent and even more clearly, show that the duration of exposure is intermittent and much less than the 48 hour continuous exposure period upon which water quality criteria and bioassay testing are based.

Ability of Receiving Waters to Achieve Designated Use

The designated uses are defined by the surface water classifications SB and SB/CSO. The SB classification designates these waters

“as a habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation. In certain waters, habitat for fish, other aquatic life and wildlife may include, but is not limited to, seagrass. Where designated in the tables to 314 CMR 4.00 for shellfishing, these waters shall be suitable for shellfish harvesting with depuration (Restricted and Conditionally Restricted Shellfish Areas). These waters shall have good aesthetic value.”

The Class SB/CSO designation is primarily related to recreational uses during wet weather conditions caused by CSOs.

Criteria for determining whether a water body supports its designated uses are presented in the *Assessment Methodology Guidelines for Evaluating Designated Use Status of Massachusetts Surface Waters—2007* (MassDEP 2007). Table ES-2 summarizes the findings of the Water Quality Study with respect to the criteria.

Although the toxicity tests indicated some level of mortality upon exposure to undiluted discharge over a 48-hour period, given the intermittent nature of the discharge, continuous exposure conditions to undiluted stormwater discharges do not occur. Based on aquatic toxicity testing and detailed modeling of the discharge, these findings indicate that the discharges from the Logan Airport outfalls would not preclude the achievement of 75% survival in ambient waters over a 48-hour exposure period—the state criterion for determination of support of aquatic life. Evaluation of oxygen demand, ammonia nitrogen, tolyltriazole, and nonylphenol data indicate that no dilution is necessary to meet water quality criteria or toxicity benchmarks.

Boston Harbor is designated as Essential Fish Habitat for several fish species. Of particular interest in the receiving waters near Logan Airport are Atlantic cod (*Gadus morhua*) and winter flounder (*Pseudopleuronectes americanus*). Both species migrate into the shallower waters of

Boston Harbor in late fall to spawn, and retreat into deeper waters during spring. Winter flounder is more likely than Atlantic cod to be affected by deicing discharge because of its preference for shallower water for spawning. The winter flounder eggs are demersal and adhesive, and could have greater exposure to the discharge, while the eggs of Atlantic cod are pelagic and would drift with the currents. However, results from the Water Quality Study indicate that neither species would be adversely affected by intermittent, short-term exposure to deicing discharge. Based on normal distribution of federally and state-listed threatened and endangered species, it is unlikely that they would be present in significant numbers in the vicinity of Logan Airport. The Water Quality Study concludes that the discharges from Logan Airport do not adversely affect the ability of the receiving waters to achieve their designated use.

Table ES-1 Water Quality Study Compliance with Section D.1. Receiving Waters Analysis and Water Quality Study Report

Section D.1 Requirement	How requirement was addressed in the Water Quality Study
Analysis of Quantities of Deicer Used	Section 3.1 Aircraft and Airfield Deicing Reports on the program to collect daily deicer usage data through the 2008-2009 season.
Analysis of the concentration of deicer chemicals in direct and indirect surface water discharges	Section 3.2 Describes the discharge monitoring program for the 2008-2009 season and reports concentrations of deicer related chemicals in discharge waters.
Develop, calibrate, verify, and use a deicer application, fate, and transport model	Section 3.1 The ADMM model was used to estimate deicer use in the historic record and to put the 2008-2009 actual use data in the context of that record. Since this analysis shows that the storms monitored in the 2008-2009 season represented the greater than 95 percentile usage events, the further assessment of impacts on water quality was based on discharge monitoring data collected in the 2008-2009 season. The ADMM and SWMM models are being refined and calibrated against the monitoring data for use in future evaluations.
Predict the location and duration of ambient receiving water deicer chemical concentrations based on deicer use, results of the outfall sampling, and the range of deicer loadings that are likely to occur at Logan Airport.	Section 4.0 describes the dilution modeling of each of the receiving waters including presentation of dilution contours and estimates of duration of exposure to outfall plumes. As noted above deicer loadings were based on the actual monitored events since they represent greater than 95 percentile of deicer use.
Predict ambient surface water concentrations of deicer chemicals and dissolved oxygen in receiving waters based on measured outfall concentrations of deicer and the use of the verified application, fate and transport model.	Section 3.2.3 describes the estimated concentration of deicer chemicals in receiving waters; Section 4.3 describes the analysis of potential dissolved oxygen impacts in Winthrop Bay; the Phase 1 investigation concluded that there would not be an impact to dissolved oxygen in greater Boston Harbor as reported in Section 1.4.
Assess the ability of the receiving waters to meet their designated uses including assessment of impacts to aquatic life and fishing, shellfishing, and recreation.	Section 5 Table 5-1 summarizes findings regarding the Massachusetts criteria for determining ability of waters to support designated uses.

Table ES-1 Water Quality Study Compliance with Section D.1. Receiving Waters Analysis and Water Quality Study Report

The analysis shall take into account the seasonal nature of deicer use activities, including the effects of snow melt.	The analysis is consistently conservative since accepted evaluation criteria are designed to assess impacts of continuous discharges and the deicer laden stormwater is both episodic and limited in duration. Only potential for acute effects on aquatic biota are relevant to evaluation of the stormwater discharges.
Contour maps and cross- sections depicting the location and duration of ambient surface water concentrations of deicer compounds and dissolved oxygen based on various tidal, storm and deicer application scenarios.	The figures in Section 4 illustrate the geographical extent and duration of the discharge plume as modeled based on the monitoring data obtained in the 2008-2009 season. As previously noted, the monitored storms represent the 95 percentile deicer use conditions.
Procedures, assumptions, and protocols used in the Water Quality Study shall be consistent with those of EPA and / or Mass DEP if applicable.	EPA and/or MassDEP accepted test methods and evaluation criteria were used throughout the study as described particularly in Section3; modeling analyses were also conducted with agency accepted programs. The use of accepted protocols and criteria results in a conservative bias as they are based on continuous longer term exposure assumptions than are the case with the discharges evaluated in this study. The WET testing protocols specify continuous 48 hour exposure. A test that allows for representative dilution over the exposure period would more accurately reflect potential impacts in the receiving water impacts. Chemical criteria for protection of aquatic life are derived from continuous longer term exposure test results and also are conservative when applied to the discharges under investigation here.
Submit a plan and schedule for the Water Quality Study to EPA and MassDEP within six months of the effective date of the permit	Submitted prior to March 28, 2008
Prepare a Water Quality Study Report presenting the data collected, methodologies, procedures and results of the Water Quality Study and submit the report to EPA and MassDEP for review and comment with 24 months of the effective date of the permit	This Water Quality Study Report is being submitted by September 28, 2009.

Table ES-2 Assessment of Achievement of Designated Use for Receiving Waters

<u>CATEGORY¹</u>	<u>WATER QUALITY CRITERIA¹</u>	<u>SUPPORT CRITERIA¹</u>	<u>WATER QUALITY STUDY FINDINGS</u>
Fish Community:	N/A	Best Professional Judgement (BPJ)	No adverse effect predicted to winter flounder or Atlantic cod for which the receiving waters are designated Essential Fish Habitat
Chemistry - Water			
Temperature	ΔT due to a discharge $\leq 2.2^{\circ}\text{C}$ between October and June.	Infrequent Excursions, BPJ (minimum of three samples representing critical period)	Discharge water temperatures are consistent with ambient concentrations
pH	6.5 - 8.5 SU and Δ 0.5 outside the natural background range	Infrequent Excursions, BPJ (minimum of three samples representing critical period)	Monitored pH in discharge waters are consistently within the specified range
Dissolved Oxygen:	>5.0 mg/L 6.5 mg/L - (caution level) ²	Infrequent Excursions, BPJ (minimum of three samples representing critical period)	7.5 - 8.5 mg/L
Toxic Pollutants:			
Ammonia	≤ 14 mg/L (pH 8, 0-10°C, 20-30 ppt) ³	Ammonia is salinity, pH and temperature dependent	≤ 11.2 mg/L
Nonylphenol	7.0 $\mu\text{g/L}$ ⁴	Infrequent excursion from criteria	2.3 $\mu\text{g/L}$
Tolyltriazoles	47,000 $\mu\text{g/L}$ ⁵	Infrequent excursion from criteria	12.2-68 $\mu\text{g/L}$
Toxicity Testing: (Water Column/Ambient)	$\geq 75\%$ survival after 48-hours exposure to ambient water	$\geq 75\%$ survival after 48-hours exposure to ambient water	Tests conducted in media representative of the discharge showed 75% survival in undiluted stormwater; unrepresentative samples indicated that a maximum of eightfold dilution would satisfy the criterion.

1-Assessment Methodology Guidelines for Evaluating Designated Use Status of Massachusetts Surface Waters—2007

2- Massachusetts Water Resource Authority (MWRA)

3- Ambient Water Quality Criteria for Ammonia Saltwater (USEPA, 1989)

4-National Ambient Water Quality Criteria (NAWQC)

5-Pillard et al. 2001

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Acronyms and Abbreviations

AAF	Anti-Icing Fluid
ACRP	Airport Cooperative Research Program
ADF	Aircraft-Deicing Fluid
ADMM	Aircraft Deicing Management Model
BOD	Biochemical Oxygen Demand
BOD5	5-Day Biochemical Oxygen Demand
cfs	Cubic Feet Per Second
cm	Centimeter(s)
CMR	Code of Massachusetts Regulations
COD	Chemical Oxygen Demand
CORMIX	EPA's Cornell Mixing Zone Expert System
CSO	Combined Sewer Overflow
DMF	Division of Marine Fisheries
DO	Dissolved Oxygen
EFDC	Environmental Fluid Dynamics Computer Code
EFH	Essential Fish Habitat
EPA	U.S. Environmental Protection Agency
ERDC	U.S. Army Engineer Research and Development Center
FAA	Federal Aviation Administration
FBO	Fixed Base Operator
ft	Foot or Feet
ft/s	Feet Per Second
ft ²	Square Feet
GA	General Aviation
GRV	Glycol Recovery Vehicle
HQ	Hazard Quotient
kg	Kilogram(s)
kg/m ³	Kilogram(s) Per Cubic Meter
LC50	50 Percent Lethal Concentration
LOEC	Lowest Observed Effects Concentration
Logan Airport	Boston Logan International Airport

m	Meter(s)
MassDEP	Massachusetts Department of Environmental Protection
Massport	Massachusetts Port Authority
mg/L	Milligram(s) Per Liter
ml	Milliliter(s)
MLW	Lean Low Water
MPN	Most Probable Number
MWRA	Massachusetts Water Resources Authority
NAWQC	National Ambient Water Quality Criteria
NEAQ	New England Aquarium
NH ₃	Available Ammonia
NOAA	National Oceanic and Atmospheric Administration
NOEC	No Observed Effects Concentration
NP	Nonylphenol
NPE	Nonylphenol Ethoxylate
NPDES	National Pollutant Discharge Elimination System
PAH	Polyaromatic Hydrocarbon
PDMs	Pavement-Deicing Materials
ppt	Part(s) Per Thousand
PSP	Paralytic Shellfish Poison (“Red Tide”)
PSU	Practical Salinity Unit(s)
SAE	Society of Automotive Engineers
SLERA	Screening Level Ecological Risk Assessment
SMS	Surfacewater Modeling System
SU	Standard Unit(s)
SWMM	Stormwater Management Model
TDN	Total Dissolved Nitrogen
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
USFWS	U.S. Fish and Wildlife Service
VIMS	Virginia Institute of Marine Science
WET	Whole Effluent Testing
1-D	One Dimensional
2-D	Two Dimensional
3-D	Three Dimensional

°C	Degrees Celsius
°F	Degrees Fahrenheit
µg/L	Microgram(s) Per Liter
µM	Micromole

1.0 Introduction and Background

1.1 Purpose

The primary goal of the Water Quality Deicing Impacts Study is to satisfy the requirements in Section D.1, Water Quality Study, in Logan International Airport's National Pollutant Discharge Elimination System (NPDES) Permit No. MA0000787, issued to the Massachusetts Port Authority (Massport) and Co-Permittees of Boston Logan International Airport (Logan Airport). The central requirement is to conduct a "biological, chemical, and toxicological analysis of Logan Airport's stormwater discharges to characterize the impacts of deicer contained in stormwater discharges." The permit language further relates the characterization of impacts to an assessment "of the ability of the receiving waters to meet their designated uses, including an assessment of impacts to aquatic life and fishing, shellfishing and recreation." The following components are identified in the requirements for this analysis:

- Measure quantities of deicer used and the concentration of deicer chemicals in direct and indirect surface water discharges
- Monitor selected outfalls continuously during a deicing episode for parameters that include temperature, dissolved oxygen (DO), and conductivity
- Develop, calibrate, verify, and use a deicer application, fate, and transport model to predict the location and duration of deicer chemical concentrations in ambient receiving water
- Predict ambient surface water concentrations of deicer chemicals and DO in the receiving waters
- Assess the ability of the receiving waters to meet their designated use(s), including an assessment of impacts to aquatic life and fishing, shellfishing, and recreation
- Develop contour maps and cross-sections depicting the location and duration of ambient surface water concentrations of deicer compounds and DO

Specific requirements of Section D.1. and the measures and analyses that Massport undertook in the Water Quality Study to effect compliance are summarized in Table 1-1.

Milestones achieved and coordination activities undertaken by Massport to comply with Section D.1, Water Quality Study thus far include:

- Massport submitted a plan and schedule for the Water Quality Study to the U.S. Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection (MassDEP) for their review and comment in March 2008.
- Massport conducted a screening level assessment of deicer use, assimilative capacity of the receiving waters, and potential ecological risk to define the impact issues and requirements for additional data and analyses to complete the Water Quality Study. The

results were reported in the *Water Quality Impacts of Deicing at Boston Logan International Airport Phase 1 Study Report* (Massport 2008). The *Phase 1 Study* was submitted to EPA and MassDEP for review and comment.

- Massport presented a briefing on the findings of the *Phase 1 Study* and proposed data collection program for the 2008-2009 deicing season to EPA in the fall of 2008.
- Massport briefed EPA on the data collected during the 2008-2009 deicing season and proposed analyses for completion of the water quality study on June 24, 2009.

This report is being submitted to EPA and MassDEP in compliance with the permit provision that a water quality study report be submitted for review and comment within 24 months of the effective date of the permit. The report was prepared by EA Engineering, Science, and Technology, Inc. The 2008-2009 data collection program conducted by CH2MHill, Inc. and Camp Dresser McKee, Inc. are the principal sources of information.

1.2 Environmental Characteristics

Logan Airport is located in East Boston and consists of approximately 1,750 acres of filled land surrounded on three sides by Boston Harbor (Figure 1-1). The waters surrounding Logan Airport are classified as SB on the northern side and SB/CSO to the south, which is identified as habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth, and other critical functions, and for primary and secondary contact recreation. The water quality standard for Class SB waters requires that DO not be less than 5.0 milligrams per liter (mg/L). Seasonal and daily variations that are necessary to protect existing and designated uses must be maintained, and where natural background conditions are lower, DO must not be less than natural background.

The Class SB/CSO designation means that this area supports recreational uses that during wet weather conditions may be impaired by combined sewer overflows (CSOs); this is significant because it acknowledges that the aquatic life community can experience transient adverse impact yet be still generally viable. Boston Inner Harbor is listed as impaired for pathogens and priority organics in the State of Massachusetts' 305(b) and 303(d) listings for 2006. This impairment is not the result of airport use. These waters include an area from the Mystic and Chelsea rivers, Chelsea/Boston, to the line between Governors Island and Fort Independence, East Boston/Boston (including Fort Point and reserved channels, and Little Mystic River).

1.3 Deicing Background

Two types of deicing operations are conducted at Logan Airport: deicing of aircraft and deicing of paved areas, including the runways, taxiways, and ramp areas (Figure 1-2). Aircraft deicing activities are primarily conducted at the aircraft gates and the deicing pad and utilize Society of Automotive Engineers (SAE)-certified propylene glycol- or ethylene glycol-based Type I aircraft-deicing fluids (ADFs) and Type IV aircraft anti-icing fluids (AAFs). Meanwhile, pavement-deicing and snow removal operations on runways, taxiways, ramp areas, and roadways and public sidewalks are primarily conducted by Massport. Airside (i.e., ramp areas, taxiways, and runways) deicing is conducted using SAE-certified pavement-deicing materials (PDMs). Liquid ethylene glycol/urea product is used as the primary airfield pavement deicing product. Infrequently, this liquid product is supplemented by a sodium acetate-based granular product.

Public roadways and sidewalks are deiced using a combination of rock salt (sodium chloride), magnesium chloride, and sand.

Deicing aircraft and airfield pavement is critical to ensuring safe flight operations during winter weather. The Federal Aviation Administration's (FAA's) "clean aircraft concept" and associated guidance require that all critical surfaces of an aircraft be free of frost, ice, or snow at take-off. Similarly, airfield pavement surfaces must provide sufficient friction for safe landings, taxiing, and take-offs during winter weather conditions. However, aircraft and airfield pavement deicers can have potential environmental implications when discharged in airport stormwater into local receiving waters. There are two primary potential environmental impacts from aircraft and airfield pavement deicing products: (1) biochemical oxygen demand (BOD), and (2) aquatic toxicity. All of the SAE-certified deicing products are based on readily biodegradable freezing point depressants that contain relatively high BOD. The ADFs and AAFs are based on propylene or ethylene glycol, whereas the PDMs used at Logan Airport are based on ethylene glycol, urea, or sodium acetate. Proprietary additives required to meet the SAE specifications are the primary source of aquatic toxicity in these products. The SAE specifications establishing performance standards also define maximum allowable fluid toxicity for Type I ADFs.

The primary pathway for deicing runoff to reach surface waters is the discharge from the airport's stormwater outfalls. More than 97 percent of aircraft deicer use occurs within the drainage areas of the North and West Outfalls. Airfield pavement deicing is distributed among a combination of the North and West outfalls and 44 smaller outfalls that drain the runways and the perimeter area of the airport (outfalls A-1 through A-44).

Logan Airport's NPDES permit authorizes discharges of stormwater to Boston Harbor, Boston Inner Harbor, and Winthrop Bay from 49 stormwater outfalls: five main outfalls (North 001, West 002, Porter Street 003, Maverick Street 004, and Northwest 005) and 44 smaller outfalls that drain the runways and the perimeter area of the airport (outfalls A-1 through A-44). The outfalls receive drainage from the five large developed or terminal drainage areas (North, Northwest, West, Porter Street, and Maverick Street) and the remaining airfield drainage areas. The locations of the outfalls and associated drainage areas are shown in Figure 1-3.

1.4 Phase 1 Study

The Phase 1 study (Massport 2008) completed in 2008 represented the first step towards meeting the permit requirement by conducting a screening-level analysis using existing data to (1) narrow the focus of investigation to potentially significant impacts that require further investigation to fully evaluate the risk, and (2) provide insight and direction to data collection, monitoring, and modeling activities in the 2008-2009 season to ensure compliance with all applicable study requirements of the Logan Airport NPDES Permit. The phased study plan is shown in Figure 1-4.

The Phase 1 study focused on evaluating deicer discharges and receiving water responses at three outfalls: North Outfall (001), Basin A21, and West Outfall (002). The North and West Outfalls were chosen because the vast majority (more than 97 percent) of all aircraft deicer application occurs within their drainage areas. Outfall A21 was selected because it was determined to have the greatest airfield pavement deicer loading of all the airfield outfalls. However, during the preliminary airfield-modeling analysis, it was determined that there were insufficient available

data to describe the processes that affect the fate and transport of applied airfield pavement deicers to the outfalls with any level of confidence. This factor excluded Outfall A21 from further study in Phase 1.

The North Outfall discharges to tidal marshes (or flats) in Winthrop Bay on the north side of Logan Airport. There are no freshwater tributaries to this embayment other than stormwater and other outfalls from Logan Airport, East Boston, and surrounding communities. The West Outfall discharges alongside the Porter Street outfall to the main Boston Inner Harbor channel on the southwest side of Logan Airport.

Deicer Use and Discharge Models

The Phase 1 study consisted of modeling to predict deicing discharges and the response of receiving waters to those discharges based on historical weather conditions. The Stormwater Management Model (SWMM) was applied in conjunction with the Aircraft Deicing Management Model (ADMM) to estimate flows, loads, and concentrations in deicing discharges. The CORMIX model was used to estimate concentrations of deicers in the receiving waters as a result of the flow and concentration characteristics defined by the airfield models. A Screening Level Ecological Risk Assessment (SLERA) consistent with EPA Ecological Risk Assessment guidance and the Massachusetts Contingency Plan was prepared based on the modeling results. Deicing discharges were characterized in terms of concentrations of primary constituents and individual aircraft-deicing products for events that are reflective of the 95th percentile deicing discharge loading. The 95th percentile deicing load discharge served as the design condition for the Phase 1 analyses.

Individual hours with maximum deicer concentrations corresponding to high flow conditions during the 3-hour, low-tide discharge periods were identified for five deicing events. The characteristics of these critical hours were then used as the basis for the CORMIX steady-state discharge analyses.

Impacts on Ambient Dissolved Oxygen Concentrations

A probable BOD impact on receiving waters was calculated by applying the total BOD load, the DO/BOD utilization ratio, and the tidal prism of the receiving waters in the vicinity of the North Outfall. The waters around the north side of Logan Airport are classified as SB. The DO water quality standard for class SB waters is 5 mg/L. Locally, the Massachusetts Water Resources Authority (MWRA) uses caution levels (80 percent saturation and 6.5 mg/L DO) to indicate if DO conditions are degrading. The estimated DO concentrations including deicing discharge impacts range from 7.7 to 8.4 mg/L, based on an average 9.3 mg/L deicing season ambient DO measured at MWRA monitoring station 130. These ranges are well above the water quality standard and MWRA caution levels. The absence of any impact on DO indicated by this analysis is consistent with the monitoring data for DO in the harbor, where no effect of deicing was noted in ambient concentrations.

Using the same basic assumptions as those applied in the North Outfall analysis, a probable BOD impact for the West Outfall was calculated. The waters around the south side of Logan Airport are classified as SB/CSO. The DO water quality standard for class SB/CSO waters is 5 mg/L. The recalculated DO concentrations with deicing discharge impacts range from 8.3 to 8.5 mg/L, well above the water quality standard and MWRA caution levels. Also, as for the North Outfall,

the absence of any impact on DO indicated by this analysis is consistent with the monitoring of DO in the harbor, where no effect of deicing was noted in ambient concentrations.

The analysis of potential DO impacts indicates that water quality standards are being maintained during significant deicing events, with a wide margin of safety. This leads to the conclusion that there are no unacceptable ecological risks associated with BOD in deicing discharges.

Potential for Toxicity to Aquatic Life

Based on the SLERA results, a number of products were identified with Hazard Quotients (HQs) greater than 1.0 and could indicate potential risk. However, the risk estimates presented in the SLERA are based on several conservative assumptions and have a high degree of uncertainty. Consequently, they should not be used for decision-making purposes. To put the identified potential risk in context, the ecological risk assessment process should proceed to a more detailed and more site-specific assessment. This second phase of the investigation involved collecting additional data and refining the evaluation to be more realistic of actual ecological receptor exposure and potential effects conditions.

The Phase 1 SLERA was designed as the first step towards satisfying the objectives of the Logan Airport Water Quality Deicing Impact Study, using existing data and information to perform a preliminary assessment of the potential significance of ecological impacts from deicing discharges from Logan Airport. As such, it was recognized from the beginning that some potential impacts might be conclusively evaluated, whereas others may require significant additional data collection and analysis to adequately assess.

Consistent with the SLERA protocols and practice, wherever assumptions were required, they tended towards the conservative side. The cumulative effect is a large margin of safety in the findings. This has two noteworthy implications: (1) Findings that indicate no significant ecological risk can be accepted with a high level of confidence, and (2) Findings of possible ecological risk cannot be interpreted as indicating there is a definite ecological impact, only that further investigation is needed.

Aquatic toxicity from deicer fluids is largely due to a small amount of chemical additives. The trend in the aircraft-deicing fluids industry is to eliminate additives with high toxicity such as nonylphenol ethoxylates and tolyltriazoles from the formulations. Water quality standards for nonylphenol (a breakdown product of nonylphenol ethoxylate) are very low; therefore, significant use of deicers with nonylphenol ethoxylate additives increases the potential for ecological risk. There are no water quality standards for tolyltriazoles, but this class of chemicals is known to contribute significant toxicity to deicer formulations (Cancilla et al. 1997). Although nonylphenol and tolyltriazoles have been detected in the North and West Outfalls during past NPDES monitoring events, only one sample at the West Outfall in February of 2008 had a nonylphenol concentration (3.28 micrograms per liter [$\mu\text{g/L}$]) that exceeded the chronic criterion (1.7 $\mu\text{g/L}$), but was below the more appropriate acute criterion (7.0 $\mu\text{g/L}$).

There has been a steady trend away from using tolyltriazole and nonylphenol ethoxylate additives in commercial ADFs, and some carriers at Logan Airport have indicated that they no longer use products containing either additive.

Discharges from airfield outfalls during deicing events are expected to be dominated by airfield pavement deicers. A screening-level mass balance analysis indicated that discharge loading of BOD and total nitrogen will result in insignificant impacts on receiving water concentrations.

Evaluation of the potential for pavement deicers to significantly affect toxicity in receiving waters was not performed in Phase 1.

1.5 Water Quality Study

The primary objective of the water quality study is to determine whether the discharge of stormwater laden with deicer fluids from Logan Airport prevents the receiving waters from achieving their designated uses. The designated uses are defined by the surface water classifications.

The SB classification designates these waters

“as a habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation. In certain waters, habitat for fish, other aquatic life and wildlife may include, but is not limited to, seagrass. Where designated in the tables to 314 CMR 4.00 for shellfishing, these waters shall be suitable for shellfish harvesting with depuration (Restricted and Conditionally Restricted Shellfish Areas).”

Massachusetts surface water quality standards are contained in 314 Code of Massachusetts Regulations (CMR) 4.00. Criteria for determining whether a water body supports its designated uses are presented in the *Assessment Methodology Guidelines for Evaluating Designated Use Status of Massachusetts Surface Waters—2007* (MassDEP 2007).

The 2008-2009 season deicing discharge monitoring effort built upon the basic compliance requirements in the NPDES permit to provide data required to support evaluation of potential water quality impacts from deicing discharges at Logan Airport. The principal elements of the study are:

- Daily logging of deicer use by users and compilation of the data;
- Continuous monitoring of three outfalls for flow and other physical parameters;
- Monitoring of three storm events using hourly (or bi-hourly) grab sampling and analysis for chemical oxygen demand (COD), ethylene glycol, propylene glycol, ammonia, and total Kjeldahl nitrogen (TKN); and
- Whole effluent (WET) aquatic toxicity tests at three outfalls and chemical analysis of the test media for the routine analytes and the toxic ADF additives nonylphenol and tolyltriazole.
- Dilution models were developed for the North, A21 and West Outfalls to examine discharge plume characteristics associated with deicing events.

Section 2 of this report provides a description of the water quality, hydrodynamic, and ecological characteristics of the environment surrounding Logan International Airport. Section 3 describes the chemical and toxicity data collection programs and reports on the results of those efforts.

The mixing zone modeling methods and results are presented in Section 4. Section 5 summarizes the conclusions of the Water Quality Study.

2.0 Physical and Ecological Setting

2.1 Criteria for Evaluation

The waters surrounding Logan Airport are classified as SB on the northern side and SB/CSO to the south. The following is a summary of the 2007 Massachusetts Surface Water Quality Standards for Class SB (314 CMR 4). These are the minimum water quality criteria required to sustain the designated uses.

Dissolved Oxygen

The water quality standard for Class SB waters requires that DO not be less than 5.0 mg/L. Seasonal and daily variations that are necessary to protect existing and designated uses must be maintained, and where natural background conditions are lower, DO must not be less than natural background.

Temperature

The water quality standard for Class SB waters requires that during the winter months (October through June) there shall not be any change in temperature greater than 4.0 degrees Fahrenheit (°F) (2.2 degrees Celsius [°C]), due to a discharge. Natural seasonal and daily variations that are necessary to protect existing and designated uses must be maintained. There shall be no changes from natural background conditions that would impair any assigned uses. This would include those conditions necessary to protect normal species diversity, successful migration, reproductive functions, or growth of aquatic organisms.

Toxic Pollutants

The water quality criteria for Class SB requires all surface waters to be free from pollutants in concentrations or combinations that are toxic to humans, aquatic life, or wildlife.

pH

The criteria for Class SB requires a pH range from 6.5 to 8.5 standard units (SU), while maintaining a change no greater than 0.5 SU from natural background conditions. No change from background conditions may impair any assigned use.

Nutrients

All surface waters shall be free from nutrients in concentrations that would cause or contribute to impairment of designated uses and shall not exceed the site-specific criteria developed in a total maximum daily load (TMDL) or as otherwise established by MassDEP.

Bacteria

In Class SB waters designated for shellfishing, fecal coliform median or geometric mean most probable number (MPN) shall not exceed 88 organisms/100 milliliters (ml), nor shall more than 10 percent of the samples exceed an MPN of 260 organisms/100 ml, or other values of equivalent protection.

Other Water Quality Criteria

Additional water quality criteria include solids, color and turbidity, oil and grease, taste and odor, and aesthetics. The surface water quality standards require that these criteria are maintained at a level that would not impair any of the designated uses.

The designated uses that could be affected by any potentially adverse effects of deicer discharges into Boston Harbor are aquatic life and shellfishing.

2.1.1 Aquatic Life Use

The Aquatic Life use designation, based on the Massachusetts Surface Water Quality Standards, states that a water body is suitable for sustaining a native, naturally diverse, community of aquatic flora and fauna, including but not limited to, wildlife and threatened and endangered species, and for their reproduction, migration, growth, and other critical functions. This use is assessed by integrating the results of biological (and habitat), toxicological, and chemical data. The nature, frequency, and precision of MassDEP's data collection techniques dictate that a weight of evidence be used to make the assessment, with biosurvey results used as the final arbiter of borderline cases.

A status of "support" for the aquatic life use is determined when the available data clearly indicates support or minor modification of the biological community. Excursions from chemical criteria are not frequent or prolonged. A status of "impaired" is based on frequent or severe violations of chemical criteria, presence of acute toxicity, or a moderate or severe modification of the biological community.

The following is a summary of the guidance used to assess the "support" or "impaired" status of Aquatic Life Use (MassDEP 2007).

Biology

The biology variables include the Rapid Bioassessment Protocol, fish community, habitat and flow, eelgrass bed habitat, non-native species, and plankton/periphyton. A support status would be assigned for infrequent excursions from criteria or minor modification of the biological community. For some variables, such as fish community, habitat and flow, and non-native species, assessment is based on best professional judgment.

Toxicity Tests

Aquatic toxicity tests listed as variables for the aquatic life use include the water column/ambient testing with 48-hour or 7-day exposure, and sediment toxicity testing. A minimum of 75 percent survival in ambient waters for both toxicity test procedures is required for support status. NPDES compliance bioassay testing may be used to identify causes of impairment where it is found.

Water Chemistry, including Temperature, pH, and Toxic Pollutants

Support status requires infrequent excursions from the minimum water quality criteria previously listed. The maximum for total residual chlorine is 0.0075 mg/L, while ammonia-N is temperature dependent for saltwater.

Additional variables for the Aquatic Life use are sediment and tissue chemistry.

2.1.2 Shellfishing Use

A support status includes “approved,” “conditionally approved,” or “restricted.” “Approved” areas are open for harvest for direct human consumption all the time and closes only due to hurricanes or other major coast-wide events (e.g., red tides). “Conditionally approved” areas are subject to intermittent microbiological pollution and are closed some of the time due to runoff from rainfall or seasonally poor water quality. “Restricted” areas contain a limited degree of pollution, and are open for harvest with depuration subject to local rules and state regulations, or for the relay of shellfish to less contaminated areas.

Impaired status could include “approved,” “conditionally approved,” “restricted,” or “prohibited.”

The assessment of status for shellfishing use is made by the Massachusetts Department of Fish and Game’s Division of Marine Fisheries (DMF).

2.2 Water Quality Characteristics

The *in situ* water quality parameters most important to the modeling applications and in determining any potentially adverse effects of deicer discharges into Boston Harbor are DO, aquatic toxicity, nutrients, salinity, and temperature. With the exception of DO, these parameters have been summarized here for only the deicing season (October 1 through April 30).

Dissolved Oxygen

Aircraft- and airfield pavement-deicing products are biodegradable and are characterized by relatively high BOD content. As a result, reduction in receiving water DO concentrations from deicing discharges is possible.

Both MWRA and the New England Aquarium (NEAQ) have collected DO data from stations in the vicinity of Logan Airport. Figure 2-1 is from the MWRA web site and shows the locations of all Boston Harbor area MWRA stations. MWRA Station 130 has DO data from 1998 to 2006, and the general collection frequency appears to be twice per month. Station 24 has data from 1989 to 2006, with a sampling frequency similar to Station 130. Station 138 DO data is available from 1993 to 2007 and has been sampled once or twice per month. NEAQ has been collecting data at their station near MWRA Monitoring Station 138 since July 2005. Review of these data shows that DO concentrations throughout the Inner Harbor area may fluctuate seasonally, with DO concentrations dropping in the summer (i.e., non-deicing season), sometimes to the point of being at or below the caution limit of 6.5 mg/L DO used by MWRA (the State of Massachusetts indicates that for class SB waters, such as those surrounding Logan Airport, the DO concentrations are not to be below 5 mg/L).

Table 2-1 summarizes the available DO data for the entire year and by deicing season only (October–April). Figure 2-2 more clearly illustrates this trend in DO data collected at adjacent MWRA and NEAQ monitoring locations within the Inner Harbor for the available period of record.

Based on a review of the available DO data, there is no evidence of water column DO concentrations falling below water quality standards (5.0 mg/L) during any of the deicing seasons over the 14-year period of record.

Nutrients

Some deicing products contain nutrients such as nitrogen and phosphorus. As a result, the additional nutrient loading due to deicing discharges could impact water quality.

There are no nutrient-related impairments identified in Boston Harbor and no TMDLs for nutrients in Boston Harbor and Massachusetts Bay. Nitrogen compounds will be of primary interest with respect to the nutrient data because nitrogen is the limiting nutrient in Boston Harbor and Massachusetts Bay. Therefore, the potential impact of nutrients is discussed below.

Characteristic of estuarine systems, the general trend for nitrogen (particularly as ammonia) is increased concentrations during late summer through winter, with concentrations dropping in early spring. Historical data show a notable drop in the magnitude of the trend after the MWRA's Deer Island Sewage Treatment Plant outfall came online in late 2000 (Figure 2-3), prior to which primary treated wastewater effluent with relatively high nutrient concentrations was released near Deer Island, just east of Logan Airport.

Table 2-2 provides a summary of the annual and deicing season ranges of the ammonia and total dissolved nitrogen concentrations before and after the treatment plant came online.

When the total dissolved nitrogen data are presented graphically, as in Figure 2-4, it can be seen that there is a general seasonal trend of elevated concentrations in the winter and lower concentrations in the summer. This trend is typically observed in New England estuaries because the dissolved nitrogen is used by phytoplankton (primarily diatoms) in the spring and summer. The planktonic and benthic invertebrates feed on the phytoplankton, and the nitrogen is tied up in their biomass. As a result, nitrogen is not detected either as ammonia or in the dissolved form. In the winter, lower temperatures and reduced sunlight greatly reduce phytoplankton density and metabolism, and more of the nitrogen remains dissolved. Thus, the higher dissolved nitrogen concentrations in the winter deicing season are driven by natural biological cycles and are not necessarily the result of external sources, which might include deicing chemicals.

Vertical Temperature, Salinity, and Dissolved Oxygen Profiles

MWRA routinely collects temperature, salinity, and DO profiles as part of its harbor-monitoring protocols. Data are collected typically at the surface, mid-depth, and bottom of the water column; however, since the three stations adjacent to this area of interest are relatively shallow, samples are generally collected only at the surface (within 1 meter [m] of the water surface) and at the bottom of the water column. Table 2-3 presents the ranges and averages of these parameters, by depth, at each station for the duration of the deicing season.

The data indicate that the water column exhibits a degree of stratification during the winter season. At all three locations the temperature and DO concentrations were lower at depth;

conversely, the salinity increased with depth. In all cases, observed DO concentrations are above the state water quality standard (5.0 mg/L).

2.3 Hydrodynamic Conditions

The water bodies adjacent to Logan Airport experience a wide tidal range between low and high water (9.49-ft mean range, 10.27-ft diurnal range). Stormwater discharges from Logan Airport typically occur toward low tide because the stormwater system is protected by tide gates to prevent tidal flow from entering into the drainage system.

The tidal currents are quite strong in the main channels around Logan Airport. A 2007 report by the United States Army Engineer Research and Development Center (ERDC) indicated that the maximum measured ebb tidal currents in the harbor were observed to be 0.9 to 3.84 feet per second (ft/s) and the maximum-measured flood currents were 0.77 to 3.61 ft/s in 2004-2005. The report noted that in general, ebb currents were observed to be stronger than flood currents. These observations were recorded by a combination of stationary and transect-recorded monitoring efforts in the main channel just outside the mouth of Boston Harbor off Deer Island, through the harbor mouth via the President Roads channel, and up into the Boston Inner Harbor channel adjacent to the southeast corner of Logan Airport.

The National Oceanic and Atmospheric Administration (NOAA) annually publishes tidal current predictions for locations throughout Boston Harbor. Predictions are calculated along the Boston Inner Harbor channel, around the east shore of East Boston, and into the Chelsea and Mystic rivers. Predictions are also calculated for the waters between the east shore of Logan Airport and Snake Island. Maximum flood and ebb velocities in these locations are calculated to be between 0.5 and 1.2 ft/s. Average velocities vary from 0 ft/s (very weak tides) to between 0.5 and 1.0 ft/s. In general, tidal velocities are strongest near the mouth of Boston Harbor at Deer Island, and decrease moving upstream into the estuary to virtually zero where tributary flow dominates estuarine circulation. Around Logan Airport, however, velocities are calculated to be strong in the channel at the West Outfall and between Logan Airport and Snake Island, which is the approach to the North Outfall.

2.4 Ecological Characteristics

The habitat immediately adjacent to the outfalls is either intertidal flats composed of unconsolidated substrates exposed at low tide or open water. Tidal channels connect some of the outfalls to the subtidal areas during low tides. These intertidal areas in Boston Harbor perform numerous functions, including surface water detention, retention of sediments, coastal storm surge detention and shoreline stabilization, provision of fish and shellfish habitat, and provision of waterfowl and waterbird habitat (Tiner et al. 2003). The North Outfall discharges into Wood Island Bay Marsh, a tidal mud flat approximately 68 acres in the Orient Heights Bay/Winthrop Bay portion of Boston Harbor. Outfall A21 also discharges to a tidal flat area of Winthrop Bay. The West Outfall discharges into a dredged shipping channel with a relatively small intertidal zone.

The vegetation in the intertidal flats is typical for estuarine emergent wetlands in Boston Harbor and is dominated by smooth cordgrass (*Spartina alterniflora*) and other halophytic plants. The more abundant high marsh species include low-growing plants such as salt hay grass (*Spartina*

patens) and salt grass (*Distichlis spicata*). Common reed (*Phragmites australis*), considered an invasive species, is also common, especially along the upland border and in more brackish conditions. Rocky areas are devoid of vegetation or covered by brown macroalgae (*Ascophyllum nodosum* and *Fucus* spp.)

The tidal flats and subtidal areas comprise unconsolidated sediments of silt, organic matter, and sand and have the potential to contain a variety of benthic invertebrate organisms. Benthic invertebrates in the intertidal and subtidal areas inhabit the sediments and surfaces of submerged objects living at the sediment–water interface (epifauna) or within the substratum (infauna). Common infaunal macroinvertebrates include segmented worms (polychaetes), snails (gastropods), bivalves (such as soft shell clams, dwarf surf clam, and blue mussel), barnacles, cumaceans, amphipods, isopods, crabs, aquatic earthworms (oligochaetes), and shrimp. Common epifauna found on the surface of bottom sediment as well as on natural and artificial hard surfaces include hydrozoans, sea anemones (anthozoans), flatworms, oligochaete worms, polychaetes, bivalves, barnacles, gammaridean and caprellid shrimp, isopods, sea squirts, sand shrimp, hermit crabs, rock crabs, grass shrimp, sand shrimp, blue crabs, mud dog whelks, mud crabs (xanthids), horseshoe crabs, lobsters, and sea slugs (nudibranch).

A Method 3 Environmental Risk Characterization had been prepared previously for the North Outfall to evaluate a historical petroleum discharge (GZA GeoEnvironmental, Inc. 2002). Although no risks were found for shore birds, concentrations of polyaromatic hydrocarbons (PAHs) were above screening levels for benthic organisms in the vicinity of the North Outfall. Sediment collected adjacent to the outfall was also found to be toxic to the saltwater amphipod *Ampelisca abdita* in 10-day exposures, although negative effects were also observed away from the outfall in areas without elevated concentrations of PAHs. There was no explanation provided for these observations. A 5-year update was reported in 2007 showing significant improvement throughout the monitored tidal flat area (GZA GeoEnvironmental, Inc. 2007).

Birds common to the tidal marsh areas in Boston Harbor include European starling (*Sturnus vulgaris*), rock pigeon (*Columba livia*), red-winged blackbird (*Agelaius phoeniceus*), barn swallow (*Hirundo rustica*), herring gull (*Larus argentatus*), and lesser yellowlegs (*Tringa flavipes*). Double-crested cormorant (*Phalacrocorax auritus*), great blue heron (*Ardea herodias*), snowy egret (*Egretta thula*), osprey (*Pandion haliaetus*), killdeer (*Charadrius vociferus*), willet (*Catoptrophorus semipalmatus*), mallard (*Anas platyrhynchos*), snowy owl (*Bubo scandiacus*), and American oystercatcher (*Haematopus palliatus*) may also be present in fewer numbers.

The finfish community in Boston Harbor is typical of large coastal estuaries and inshore waterways, supporting a variety of estuarine, marine, catadromous, and anadromous fish species. In Boston Inner Harbor, estuarine species are expected to include winter flounder (*Pseudopleuronectes americanus*), blue fish (*Pomatomus saltatrix*), Atlantic menhaden (*Brevoortia tyrannus*), hogchoker (*Trinectes maculatus*), white perch (*Morone americana*), bay anchovy (*Anchoa mitchilli*), mummichogs (*Fundulus heteroclitus*), pipefish (*Syngnathus fuscus*), threespined stickleback (*Gasterosteus aculeatus*), inland silverside (*Menidia beryllina*), striped killifish (*Fundulus majalis*), white catfish (*Ameiurus catus*), fourspined stickleback (*Apeltes quadracus*), striped mullet (*Mugil cephalus*), and tidewater silverside (*Menidia peninsulae*).

Marine mammals also use Boston Harbor. The most commonly observed marine mammal is the harbor seal (*Phoca vitulina*). Although less frequent, the grey seal (*Halichoerus grypus*) is

regularly seen in similar locations. Although common in Massachusetts Bay and other offshore waters, cetacean (whales, dolphins, and porpoises) occurrences in the harbor are generally limited to single individuals that are likely unhealthy or lost. These marine mammals are unlikely to occur near the outfalls due to the highly developed and bulkheaded shoreline and shallow water depth.

2.4.1 Shellfish

Boston Inner Harbor is listed as impaired for pathogens and priority organics in the State of Massachusetts' 305(b) and 303(d) listings for 2006. These waters include an area from the Mystic and Chelsea rivers, Chelsea/Boston, to the line between Governors Island and Fort Independence, East Boston/Boston (including Fort Point and reserved channels, and Little Mystic River). As of April 2008, Boston Inner Harbor is listed on the proposed 305(b) and 303(d) listings for 2008. A current shellfish advisory by the Boston Harbor Association advises of a prohibition of recreational shellfishing in Boston Harbor due to bacterial and chemical contamination.

The Massachusetts Department of Fish and Game's DMF has issued a listing of Paralytic Shellfish Poison (PSP) (also known as "red tide") closures as of June 25, 2009. Shell fishing is prohibited in Boston Harbor due to red tide, with the exception of razor clams, adductor sea scallops, and soft shell clams

2.4.2 Essential Fish Habitat

Boston Harbor is designated as Essential Fish Habitat (EFH) for several species. The "Guide to Essential Fish Habitat Designations in the Northeastern United States" (<http://www.nero.noaa.gov/hcd/webintro.html>) was consulted to determine the species and life stages of fish, shellfish, and mollusks for which EFH has been designated in a selected 10-ft by 10-ft square of latitude and longitude. The selected 10-ft by 10-ft square coordinates include Boston Inner Harbor (north, 42°30.0' N; east, 71°00.0' W; south, 42°20.0' N; and west, 71°10.0' W). Species for which EFH has been designated are presented in Table 2-4. Of particular interest in the receiving waters are Atlantic cod (*Gadus morhua*) and winter flounder (*Pseudopleuronectes americanus*). Habitat requisites and potential use of the Logan Airport environs during the winter seasons are described further below, based on NOAA Technical Memoranda NMFS-NE 138 and NMFS-NE-190.

Winter Flounder

Winter flounder are distributed along the northwest Atlantic Coast as far north as Labrador and as far south as Georgia, and are ubiquitous in inshore areas along the Massachusetts coast. Adult winter flounder migrate inshore in the fall and early winter. In Massachusetts Bay, spawning occurs inshore in late winter and early spring (February and March) (U.S. Department of Commerce, NOAA 1999). Spawning can occur at depths from 1.8 to 3.6 m and at salinities as low as 11 parts per thousand (ppt), and before temperatures reach 3.3°C with an upper limit of about 4.4-5.6°C. After spawning, adults typically leave shallower waters, although some remain inshore year round.

The eggs of winter flounder are demersal, adhesive, and stick together in clusters. Hatching occurs in 2-3 weeks, depending on the temperature. Larvae are initially planktonic, but become

increasingly bottom-oriented as metamorphosis approaches, which occurs between 5 and 8 weeks after hatching. Off southern New England, the young-of-the-year remain in shallow water during the first year.

Atlantic Cod

Adult Atlantic cod typically move into shallow coastal waters during the fall and then retreat into deeper waters during spring, although the degree of migration is less with Atlantic Cod than has been observed with Winter Flounder. Spawning occurs year round, but peaks during winter and early spring, usually in water temperatures between 5 and 7°C. While spawning occurs in areas other than inshore waters, within Massachusetts Bay, peak spawning activity occurs during January and February. Although spawning occurs in water between 1.5 to 330 m in depth, the optimum depth is between 40 and 136 m (U.S. Fish and Wildlife Service [USFWS] 1978). The eggs are pelagic and drift for 2-3 weeks before hatching (U.S. Department of Commerce, NOAA 2004). The larvae are also pelagic until they reach 4-6 centimeters (cm) in about 3 months, when they descend to the bottom and tend to move into deeper water as they grow older. Due to tidal currents and the tendency of eggs and larvae to drift, and the preference for deeper water, the degree of exposure to stormwater discharges from Logan Airport outfalls would be relatively low.

2.4.3 Rare, Threatened, and Endangered Species

Federally and state-listed threatened and endangered species potentially impacted by discharge at the outfalls were considered by EPA in the NPDES Permit application review (U.S. EPA 2008). The EPA review focused primarily on marine mammals, sea turtles, and anadromous fish. Based on the normal distribution of these species, EPA concluded that it was highly unlikely that they would be present in the vicinity of Logan Airport's discharge. USFWS also informed EPA that no species of concern are present at Logan Airport or in Boston Harbor (Massport 2008).

3.0 Chemical and Biological Assessment

The 2008-2009 deicing discharge monitoring effort built upon the basic compliance requirements in the NPDES permit to provide data required to support evaluation of potential water quality impacts from deicing discharges at Logan Airport. The principal elements of the 2008-2009 deicing season monitoring program were:

- Daily logging of deicer use by users and compilation of that information;
- Continuous monitoring of three outfalls for flow and other physical and chemical parameters;
- Monitoring of three storm events using hourly (or bi-hourly) grab sampling and analysis for COD, ethylene glycol, propylene glycol, ammonia, and TKN; and

- Aquatic toxicity tests at three outfalls and chemical analysis of the test media for the routine analytes and the toxic ADF additives nonylphenol and tolyltriazole.

Stormwater discharges from three separate deicing episode events were monitored continuously (i.e., for 24 hours) at the three outfall locations identified in the Phase 1 study (North Outfall, West Outfall, and Outfall A21). Samples were collected using automatic sampling devices to characterize the impacts of deicing activities and products on stormwater quality and to quantify resulting pollutant concentrations and loadings to receiving waters.

The water quality assessment evaluated the undiluted discharge waters with respect to the criteria for determining whether the receiving waters support or impair the achievement of their respective designated uses. Where undiluted discharge waters meet the criterion, a no adverse impact determination can be made. Where undiluted discharges have the potential to not meet the ambient water quality criteria, the effect of dilution in the receiving water body and potential duration of exposure were further evaluated using the results of the mixing zone model analyses.

3.1 Aircraft and Airfield Deicing

Aircraft Deicing

Aircraft deicing is conducted by individual tenants and fixed base operators (FBOs) using SAE-certified propylene glycol- or ethylene glycol-based products. Type I ADFs are used for removing frost, ice, and snow from aircraft surfaces. Type I ADFs are applied at various mixture strengths, depending on air temperature and deicing application equipment capabilities to adjust the mixture. Type IV AAFs are used as required to keep those surfaces free of frost, ice, or snow prior to an airplane taking off. Type IV products are applied without dilution.

Aircraft deicing is conducted at aircraft gate areas and one off-gate deicing near the end of Runway 14 and Taxiway J (the “Juliet pad”). One co-permittee periodically uses glycol recovery vehicles (GRVs) to collect spent ADF from apron surfaces during dry weather deicing activities. Recovered fluids are discharged to the sanitary sewer under a permit with MWRA. Other spent aircraft deicers are not recovered.

Pavement Deicing

Massport’s pavement deicing activities are divided into airside (ramp areas, taxiways, and runways) and landside (public roadways and sidewalks) categories. All pavements typically are plowed or swept to physically remove snow and ice prior to the application of chemical deicers. Airside deicing is conducted using SAE-certified products only. The extent of this deicing is dependent on the operational and weather conditions associated with the deicing event. When required, the ramps, taxiways, and runways are deiced and anti-iced using a liquid product containing 50 percent ethylene glycol and 18.6 percent urea, the remaining constituents being water and dipotassium phosphate (per material safety data sheets). A sodium acetate-based granular deicer is used periodically to break up ice and hard packed snow. Typically, only some of the runways and taxiways are deiced during any given event.

North 001

The drainage area contributing runoff to the North Outfall is approximately 152 acres and includes Terminal E; the apron and taxiway between Terminals C and E; a portion of the outer taxiway; the north taxiway area including hangars; and the north cargo buildings. Aircraft

deicing activities occur at Terminal E, Terminal C, and portions of the north cargo area. General aviation (GA) activities also take place in this drainage area.

Pavement deicing activities occur on the taxiways and the portion of Runway 15R/33L in the North Outfall drainage area.

West 002

The drainage area contributing runoff to the West Outfall is approximately 449 acres and includes Terminals A, B, and C; the apron and taxiways between Terminals B and C; a portion of the outer taxiway; taxiways P and E; and the cargo areas. Aircraft deicing activities occur at Terminals A, B, and C; portions of the north cargo area; and the south cargo area.

Pavement deicing activities occur on the taxiways and portions of Runways 4/22 and 9/27 in the West Outfall drainage area. Landside roadways within the West Outfall drainage area are also deiced.

Airfield Outfalls (A1–A44)

The airfield outfall drainage areas total approximately 907 acres and include runoff from multiple taxiways and runways. Taxiways and runways are deiced by Massport Facilities. Outfall A21 was targeted for evaluation in this study as representing the largest area of airfield drainage. This area of drainage includes the most frequently deiced runways based on Massport's snow removal plan.

The 2008-2009 program for collecting high-resolution deicer usage information involved reporting by tenants and FBOs of the following data using a standard form:

- Product identification and constituents
- Date/Time
- Aircraft type
- Application concentration
- Location of application

Pavement deicer usage was reported by Massport and data included product identification, application locations, amount, and time of use.

2008-2009 Deicing Events

Figure 3-1 shows the daily application profile for the 2008-2009 winter season. Table 3-1 summarizes use data for the major events of the season based on reported use of ADF and AAF. The events that were included in the 2008-2009 monitoring program are shown in bold on the table (December 19-20, January 11, January 28, and March 2). Deicer quantity applied does not necessarily increase as severity of the event increases (amount of snowfall) because under more severe conditions airline operations are reduced. Table 3-1 also shows the ranking of ADF use in the 2008-2009 season demonstrating that the five days that were monitored (see Section 3.2) all fell within the rank of the top twelve days of usage. While the average annual snowfall for

Boston over the 61 year period of record is 42.4 inches, the twelve events shown on Table 3-1 represent 57.6 inches of snowfall making the period of study an above average year.

It was proposed in Phase 1 that a suitable “design” condition would represent approximately 95 percent of deicing events and was defined through the use of the ADMM. Specifically, the ADMM estimates ADF application based on weather conditions and flight schedule. The 2008/2009 season was modeled using ADMM and compare to model results for the 61-year meteorological record using the same flight schedule each of the 2008-2009 monitored storms ranked higher than the 95th percentile in estimated ADF usage in that analysis. It is noted that while the ADMM model over predicted the amount of ADF used, it is valid in determining usage on a relative basis and confirms that the monitored storm events fall within the 95th percentile of storms on the basis of ADF usage.

Since the actual monitored storms fit the significance criterion for evaluation of water quality impact proposed in Phase 1 and since they were among the significant events of the year, the water quality assessment presented in this report is based on the actual water chemistry and toxicity data collected in the 2008-2009 monitoring program. The ADMM and SWMM models for Logan Airport will be calibrated to these data sets and applied to evaluation of deicing practices in the future.

3.2 Characterizing Deicer Discharges to Receiving Waters

3.2.1 Data Collection

Physical, chemical, and toxicological parameters associated with deicing runoff were measured at the North, West, and A21 outfalls during three sampling events using a combination of inline continuous data loggers, automated grab samplers, and manual grab sampling. A minimum predicted 2 inches of snowfall or 0.2 inches of freezing rain over a 24-hour period was used as a trigger for anticipating aircraft and pavement deicing activity of sufficient magnitude to conduct monitoring. Table 3-1 indicates which events were sampled, and an inventory of all discrete samples collected for the water quality study is presented in Table 3-2.

Continuous Measurements

Water elevations, velocity, and direction of flow were measured using flow meters installed in the pipes immediately upstream of each outfall. The measurements were used to calculate flow, and both measured and calculated values were recorded at 15-minute intervals. *In situ* monitoring devices were used to collect measurements of temperature, DO, and conductivity. The data record for the continuous monitors extends from November 21, 2008 to March 31, 2009.

Discrete Samples

Outfall discharge grab samples collected in the Phase 1 study at the North and West Outfalls are included in this evaluation. On February 7 and 22, 2008, samples were analyzed for COD, 5-day biochemical oxygen demand (BOD5), nonylphenol, and tolyltriazole. On March 15 and 19, 2008, samples were collected from the North and West Outfalls and tested for aquatic toxicity as well as chemical parameters.

Autosamplers were installed at the North, West, and A21 Outfalls to collect water quality samples at intervals throughout each of three deicing events. All deicing event samples were analyzed for COD, TKN, and ammonia. Every other sample was also analyzed for propylene glycol and ethylene glycol. Storm monitoring events began on December 19, 2008 (24 hours), January 11, 2009 (46 hours), and January 28 and 29, 2009 (46 hours). Samples were collected hourly for the first event and every 2 hours for the second two events. Each outfall is regulated by tidegates that allow discharge only during the ebbing phase of the tidal cycle. Samples were collected throughout the event to allow for future development of the Logan Airport stormwater model. Stormwater builds behind the tide gates during the flood stage; the system itself acts similar to an equalization basin wherein the deicing fluid component tends to be reduced in concentration prior to discharge. Characteristics of the stormwater within the system are not relevant to evaluation of impacts on the receiving waters; only the samples at time of discharge are of concern in assessing impacts to the receiving water quality.

Toxicity Testing

As part of the NPDES Permit's required monitoring, toxicity bioassays are conducted with water collected from the North and West Outfalls. Survival and growth are measured in larval inland silversides (*Menidia beryllina*) exposed for 7 days, and fertilization is measured in sea urchin (*Arbacia punctulata*) gametes exposed for 1.3 hours. Toxicity testing was conducted on samples collected on March 15, 2008 and March 19, 2008.

Additional samples for monitoring toxicity bioassays were collected for this evaluation. However, since *Arbacia punctulata* stock was not available in December 2008, *Mysidopsis bahia* was substituted as a test species. In March, when *Arbacia punctulata* stock became available, bioassay tests were conducted on all three species at the North and A21 Outfalls. The March 2-3 storm event was not one of the events monitored for continuous chemical water quality, but chemical analyses for COD, ethylene glycol, propylene glycol, ammonia, TKN, nonylphenols, and tolyltriazoles were conducted for the toxicity test samples that were collected. The toxicity bioassays and associated chemical tests are listed in the sample inventory in Table 3-2.

3.2.2 Data Quality and Usability Review

This section describes the limitations of the data collected in the program for application to the determination of whether the effluent discharged from the outfalls at Logan Airport during a deicing event adversely impact the capacity of receiving waters to achieve their designated uses. These limitations are described: (1) in terms of applicability of the testing or sampling protocol to characterize the exposure pathway, (2) in terms of source and duration of exposure, and (3) in terms of deviations from the sampling and analysis protocols that impact data quality.

The receiving waters around Logan Airport are tidal and the airport's stormwater discharges are intermittent, lasting for up to 4 hours generally from mid ebb to low slack tide. The Whole Effluent Testing protocols including the compliance monitoring bioassays specified in Logan Airport's NPDES permit are designed to evaluate continuous effluent releases that are homogeneous. The 7-day chronic endpoint toxicity bioassays do not accurately reflect the exposures experienced by aquatic receptors in the receiving waters. The 7-day test significantly overestimates exposure. The *Arbacia punctulata* bioassay tests for diminution of fertilization would reflect a potential population level impact if the release were continuous; however, since releases are intermittent this test also overestimates exposure. The growth endpoint of the

Menidia test is also a chronic endpoint that is not relevant to evaluation of the exposure pathway in this evaluation. The discharges from the Logan Airport outfalls are limited in duration and variable in quality. It should also be noted that the test protocol specifies conducting the tests at a temperature of 24°C while the ambient water is typically less than 10°C during the winter period of reduced biological activity. Though also not strictly applicable, based on exposure and temperature, the acute survival endpoint tests for *Menidia* and *Mysidopsis* are considered in this evaluation.

All three outfalls are controlled by tide gates releasing effluent only on ebbing or low slack tides. While data were collected throughout the three storm events, only the data for the periods when effluent was being released to the receiving waters are relevant to evaluation of impact on the receiving waters. Therefore, the time samples were collected and the flow data from the continuous monitoring instruments were cross-referenced to identify those samples that are representative of releases to the receiving waters. Those samples are used in the evaluation of potential to impact achievement of designated use.

The bioassay test sample for the March 2 and 3, 2009 collection methodology consisted of four autosamplers that were programmed to collect composite samples at the West, North, and A21 outfalls around low tide when deicer concentrations were expected to be at their peak. Since hourly (or bi-hourly) grab samples were not collected for this event, it is not possible to assess the relative concentration of deicer-related chemicals during the entire storm. However, the continuous monitoring of physical parameters clearly indicates that flow from the North Outfall had declined from 20 to 0 cubic feet per second (cfs) and continued to be 0 for the 4-hour collection period. The recorded depth of water declined from 50 inches just before outflow began to 26.65 inches (a drop of 23.35 inches) at the start of sampling; water depth declined to 25.81 inches (a decline of 0.8 inches) at the end of the sampling period. This indicates that the water sampled represents minimal, if any, discharge to the receiving waters and, therefore, is not relevant to evaluation of impact on the receiving water. Further the test media contained particulate matter indicating that the sample was likely pumped from a portion of the stormwater system that is not representative of discharge waters.

Alpha Analytical conducted the analyses for propylene glycol and ethylene glycol throughout the 2008-2009 deicing season monitoring program. Detection limits for these compounds varied from less than 5 mg/L to less than 2,500 mg/L through the duration of the project. In most instances where detection limits were elevated due to the requirement for dilution, some detected concentrations were reported and those series of samples are included in this evaluation. However, the sample series for all outfalls for the January 28 event were reported at less than 2,500 mg/L with no detected records. The laboratory reported that the dilutions and consequently high detection limits resulted from matrix interference. The bioassay media from the March 2 and 3 event were similarly reported with high detection limits and no detected records. The propylene glycol and ethylene glycol results for these events are considered to be not usable in this evaluation.

New England Bioassay, Inc. reported that the bioassay tests for the March 15, 2008 tests of effluent from the North and West Outfalls were set up past the 36-hour holding time but within 48 hours. This deviation from protocol should be noted in evaluation of the significance for interpreting potential for impact to receiving waters especially considering the short-term intermittent exposure pathway in the receiving water.

3.2.3 Results of Sampling and Testing Program

The *Assessment Methodology Guidelines for Evaluating Designated Use Status of Massachusetts Surface Waters* provide the basis of this evaluation of whether discharges from the outfalls at Logan Airport adversely impact the ability of the receiving water to meet designated uses. The designated uses for Class SB waters are “as habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation.” The receiving waters of North Outfall and A21 are designated as Restricted and Conditionally Restricted Shellfish Areas which should be suitable for shellfish harvesting with depuration.

As determined in the Phase 1 evaluation, the characteristics of stormwater associated with deicing events that potentially affect the capacity of receiving water to meet the designated use to support aquatic life are:

- Loadings of constituents whose degradation results in oxygen depletion (COD or BOD) – The demand on oxygen in the receiving waters is effected over a period of time longer than the period of discharge. Phase 1 modeling results showed that under the predicted loads of a 95th percentile storm the discharges from Logan Airport did not affect compliance with the DO standard of 5.0 mg/L. Prolonged and/or severe excursions from criteria indicate impairment while a condition supporting this use allows infrequent excursions during the critical period. The critical period is summer and not relevant for evaluating deicer discharges.
- Toxic Pollutants – Impairment is defined by frequent and/or prolonged excursions from criteria (exceeding more than 10 percent of measurements). Infrequent excursions from criteria still allow a determination that the waters support the designated use. Any exceedances of criteria from the outfalls would be infrequent and short term. Ammonia-N is a constituent of deicer-laden discharges that could potentially be toxic to aquatic life. Concentrations of ammonia-N released from each outfall are discussed below. Nonylphenols and tolyltriazoles have been identified as additives in deicing fluids that are toxic to aquatic life and are discussed below
- Toxicity Tests – Toxicity testing of the receiving waters indicate that there is impairment with respect to this support of aquatic life if there is less than 75 percent survival in either 48-hour or 7-day exposure in tests of ambient waters. Possible causes/sources of impairment may be identified through whole effluent toxicity testing compliance of NPDES facilities.

Criteria for evaluating shellfishing use, primary contact recreation, and secondary contact recreation are based on bacterial counts and aesthetic factors which are not affected by discharges of stormwater during deicing events.

The results of the sampling program for COD, propylene glycol, ethylene glycol, and ammonia nitrogen are presented and discussed for each outfall in Section 3.2.3.1, and whole effluent bioassay tests, nonylphenol, and tolyltriazole results are presented in Section 3.2.3.2.

3.2.3.1 Chemical Characterization of Outfall Discharges

Tables 3-3, 3-4, and 3-5 show the concentrations of COD, ethylene glycol, propylene glycol, ammonia, and TKN in the water discharged from each of the outfalls during the three monitored storm events. In addition to showing the concentrations when flow monitors indicated the significant release was occurring, for each event the table shows the overall range of concentrations measured at the monitoring location within the storm sewer system.

The Phase 1 Study included a conservative analysis of impact of deicer fluid oxygen demand on the receiving waters and found that ambient DO would be in the range of 7.5 to 8.5 mg/L and would be well above the MWRA caution level of 6.5 mg/L.

The toxicity of ammonia in surface waters varies with pH, temperature, and salinity. For conditions typical of the receiving waters during the deicing season (pH of 8, temperature of 0-10 degrees Celsius, and a salinity of 20-30 parts per thousand), ammonia nitrogen of 14 mg/L in the receiving water could potentially indicate an exceedance of the acute criterion as defined in *Ambient Water Quality Criteria for Ammonia (Saltwater)* (U.S. EPA1989). The criterion of 14 mg/l represents a pH of 8 and temperature of 10 degrees Celsius and is the minimum for the receiving water conditions. At a pH of 7 the criterion would be over 130 mg/l and if the temperature were 0 degrees Celsius with a pH of 7, the criterion would be twice that concentration. The maximum concentration measured in the stormwater discharged from all outfalls was 11.2 mg/L, indicating that ammonia nitrogen discharged from the stormwater system would not adversely impact ambient water quality. The median concentration of ammonia discharged from each outfall was 1.4 mg/l.

The data for each outfall are discussed below.

West Outfall

The discharges from the West Outfall had the highest concentrations of COD with the maximum 23,000 mg/L reported for the January 11 event at 16:00 (4:00 p.m.). The lowest discharge concentration reported was 540 mg/L on January 29 at 6:00 a.m. The median of measured discharge concentrations was 4,800 mg/L. Glycol concentrations tended to be higher where COD concentrations were higher.

Ammonia and TKN measurements in the West Outfall were lowest of the three outfalls with concentrations ranging from 0.9 to 6.68 mg/L for ammonia and 1.9 to 19 mg/L for TKN. Ammonia and TKN in the discharge from the West Outfall does not represent a potential for adverse impact due to ammonia toxicity.

North Outfall

The discharges from the North Outfall had the second highest concentrations of COD with the maximum 8,900 mg/L reported for the December 20 event at 9:00 a.m. The lowest discharge concentration reported was 260 mg/L on January 28 at 20:00 (8:00 p.m.). The median of measured discharge concentrations was 1,600 mg/L. Glycol concentrations tended to be higher where COD concentrations were higher.

Ammonia measurements ranged from 0.42 to 11.2 mg/L, and TKN measurements ranged from less than 2 to 42 mg/L. Ammonia and TKN in the discharge from the West Outfall does not represent a potential for adverse impact due to ammonia toxicity.

A21

Outfall A21 discharges runoff from the airfield and does not receive runoff from aircraft deicing operation areas. Consistent with that, COD concentrations in the discharge waters were lowest of the three outfalls ranging from less than 80 to 680 mg/L. None of the samples collected in the A21 system exceeded 1,000 mg/L COD. Neither propylene glycol nor ethylene glycol was detected in any of the samples collected in the A21 system.

Ammonia and TKN concentrations were similar to concentrations in the discharges of the West Outfall and North Outfall. Ranging from 0.25 to 8.66 mg/L, ammonia in the discharge from the A21 Outfall does not represent a potential for adverse impact to the receiving water due to ammonia toxicity.

3.2.3.2 Ecotoxicity Evaluation

As described above, Massachusetts defines the toxicity test criterion for assessing whether waters support or impair designated use for aquatic life as 75 percent survival after 48-hour (acute) or 7-day (chronic) exposure to the surface waters. Following this guidance and the nature of the stormwater discharges as short term and intermittent, only the acute bioassay test results are considered relevant to this assessment. It should be noted that the acute bioassay test results would be an overestimate of exposure given the intermittent nature of the stormwater discharges. Results reflecting chronic effects are presented only to inform interpretation of possible causes of adverse effects in the tests themselves, not as an indication that they are relevant to predicting impacts in the receiving waters. Results of whole effluent toxicity tests and analyses of potentially toxic chemicals are shown in Tables 3-6, 3-7, and 3-8.

Potential sources of toxicity are ammonia, nonylphenols, and tolyltriazoles. Nonylphenol, the precursor of which is nonylphenol ethoxylate (NPE), is a surfactant that makes up 0.1 percent of the application strength of one Type I deicing fluid, a product that was reportedly phased out of use at Logan Airport by the end of the 2007–2008 deicing season. This same product also contains tolyltriazoles, another category of additives that is known to add toxicity.

The National Ambient Water Quality Criteria (NAWQC) lists chronic and acute criteria of 1.7 and 7.0 µg/L in saltwater, respectively, for nonylphenol. Only the acute criterion is applicable under the tidally-fluctuating conditions in the Logan Airport receiving waters. The maximum detected concentration of nonylphenol in the Logan Airport stormwater was 2.3 µg/L. Calculation of an HQ, where the maximum concentration is divided by the acute criterion, gives the result 0.33. This HQ of less than 1.0 indicates that there is no potential risk to aquatic biota due to nonylphenols.

There are no NAWQC criteria for tolyltriazoles. The most relevant information to this assessment was reported by Pillard et al. (2001). The data are summarized below:

- **4-methyl-1h-benzotriazole:** Limited aquatic toxicity data are available for this compound. The fathead minnow was the most acutely sensitive, with a 96-hour 50 percent Lethal Concentration (LC50) of 63,000 µg/L (the acute no observed effects condition [NOEC] and lowest observed effects condition [LOEC] from the study were 47,000 and 95,000 µg/L, respectively).

- **5-methyl-1h-benzotriazole:** Aquatic toxicity data are also limited for this benzotriazole compound, with the lowest toxicity value identified again being an acute LC50 for the fathead minnow. Pillard et al. (2001) reported a 96-hour LC50 of 22,000 µg/L.

The data indicate levels of acute toxicity to the fathead minnow in the parts per million range compared to the parts per billion concentration range (12.2 to 68 µg/L) for total tolyltriazoles reported for the Logan Airport bioassay test media during the 2008-2009 season. While the benchmarks reported by Pillard et al. are for freshwater species, there is substantial basis for assuming that saltwater species would not be one thousand times more sensitive. Comparison of freshwater and saltwater toxicity benchmarks for all chemicals listed by NOAA in the *Screening Quick Reference Tables* (Buchman 1999) shows at most a factor of 300 for increased saltwater sensitivity. Where saltwater species are more sensitive, the difference is typically less than a factor of 20. The results of laboratory analyses on deicing and anti-icing products conducted for the Airport Cooperative Research Program (ACRP) 02-01 project indicate no significant difference in the sensitivity of freshwater and marine organisms. Thus, the screening values are considered protective of both freshwater and marine organisms. In order to be conservative, a benchmark was derived by applying a safety factor of 100 to the freshwater acute NOEC of 47,000 µg/L. Comparing this benchmark to the maximum measured tolyltriazole concentration of 68 µg/L, an HQ of 0.15 is obtained. This HQ of less than 1.0 indicates that there is no potential risk to aquatic biota due to tolyltriazoles.

Ammonia toxicity varies with pH, salinity, and temperature. A benchmark for toxicity evaluation was derived in this study to reflect the ambient receiving water conditions. Ammonia is toxic at lower concentration in higher pH waters and lower temperature; therefore, the benchmark was set to the limiting level of those parameters in the receiving waters—i.e., a pH of 8 and a temperature of 0°C. At a salinity of 20 ppt the criterion for ammonia toxicity would be 29 mg/L, while at 30 ppt the criterion would be 14 mg/L. The criterion for evaluation of ammonia toxicity is set conservatively at 14 mg/L. The maximum measured concentration of ammonia in this water quality study was 11.2 mg/L, resulting in an HQ of 0.8 and indication that there is no potential for risk due to ammonia toxicity.

Arbacia punctulata Fertilization Tests

The results of *Arbacia punctulata* fertilization tests are shown on Table 3-6. These are chronic tests and not directly applicable to evaluating effects of Logan Airport discharges on the receiving waters, but are presented to assess the relationship of test results to presence of toxic chemicals. It is also important to note that the tests conducted on samples from March 15, 2008 were initiated outside the specified holding time of 36 hours. The tests of March 2 and 3, 2009 samples were judged not to be representative of discharges from the outfalls since there was no discharge flow recorded at the time of sampling. The samples contained uncharacteristic black particulate material that was likely residue accumulated within the stagnant portion of the stormwater system. Ethylene and propylene glycol results from those dates are not reported due to this significant matrix interference.

Review of the reported test results and the concentrations of COD, ammonia, tolyltriazole, and nonylphenol in the test media do not indicate any clear relationship. Ammonia, tolyltriazole, and nonylphenol did not exceed toxicity benchmarks or criteria.

***Mysidopsis bahia* Tests**

The results of *Mysidopsis bahia* (*Americamysis bahia*) tests are shown on Table 3-7. The acute LC50 results are relevant to evaluating potential for effects on the ability of receiving waters to support aquatic life; the results of the growth evaluation are not directly applicable to evaluating effects of Logan Airport discharges on the receiving waters, but are presented to assess relationship of test results to presence of toxic chemicals. The tests of March 2 and 3, 2009 samples were judged not to be representative of discharges from the outfalls since there was no discharge flow recorded at the time of sampling. The samples contained uncharacteristic black particulate material that was likely residue accumulated within the stagnant portion of the stormwater system. Ethylene and propylene glycol results from those dates are not reported due to this significant matrix interference.

Review of the reported test results and the concentrations of COD, ammonia, tolyltriazole, and nonylphenol in the test media do not indicate any clear relationship. Ammonia, tolyltriazole, and nonylphenol did not exceed toxicity benchmarks or criteria.

***Menidia beryllina* Tests**

The results of *Menidia beryllina* tests are shown on Table 3-8. The acute LC50 results are relevant to evaluating potential for effects on the ability of receiving waters to support aquatic life; the results of the growth evaluation are not directly applicable to evaluating effects of Logan Airport discharges on the receiving waters but are presented to assess relationship of test results to presence of toxic chemicals. It is also important to note that the tests conducted on samples from March 15, 2008 were initiated outside the specified holding time of 36 hours. The tests of March 2 and 3, 2009 samples were judged not to be representative of discharges from the outfalls since there was no discharge flow recorded at the time of sampling. The samples contained uncharacteristic black particulate material that was likely residue accumulated within the stagnant portion of the stormwater system. Ethylene and propylene glycol results from those dates are not reported due to this significant matrix interference.

Review of the reported test results and the concentrations of COD, ammonia, tolyltriazole, and nonylphenol in the test media do not indicate any clear relationship. Ammonia, tolyltriazole, and nonylphenol did not exceed toxicity benchmarks or criteria.

3.2.4 Dilution Needed to Meet Ambient Water Quality Criteria

As demonstrated in Phase 1 and further discussed in Section 4.3, Winthrop Bay Flushing Model of this Water Quality Study, the COD and ammonia loadings from Logan Airport Deicing activities do not cause the DO in the receiving waters to drop below the criterion of 5 mg/L.

Ammonia nitrogen, tolyltriazole, and nonylphenol data indicate that no dilution is necessary to meet water quality criteria or toxicity benchmarks. The benchmarks, maximum measured concentration, and resultant HQ for the potentially toxic parameters are summarized below. In all cases the HQ is less than 1.0, indicating that even in the undiluted stormwater discharge, these parameters are not present at levels that represent a potential risk to aquatic biota.

Parameter	Criterion	Maximum Monitored Concentration	Hazard Quotient (HQ)
Ammonia	14 mg/L	11.2 mg/L	0.80
Nonylphenol	7.0 µg/L	2.3 µg/L	0.33
Tolyltriazole	470 µg/L	68 µg/L	0.15

The criterion for impairment of the receiving water's ability to support aquatic life is-

“Toxicity testing of the receiving waters indicate that there is impairment with respect to this support of aquatic life if there is less than 75 percent survival in either 48-hour or 7-day exposure in tests of ambient waters.”

Table 3-9 presents the results of the acute whole effluent testing conducted in this study. In addition to the LC50, the LC25 has been calculated. The LC25 is the concentration of stormwater in which 75 percent of the organisms survived after 48 hours. The table also lists for each test whether there were any limitations in the tests as conducted. These limitations were described in detail in Section 3.2.2. The limitations identified are that some tests were run past holding time and some samples were collected from the stormwater system after discharge flow had ceased and were not representative of the typical discharge waters. As shown on Table 3-9, where there were no identified limitations in the test, 75 percent of the organisms survived in 100 percent stormwater discharge, and the criterion for ambient waters was met with no dilution requirement. For the tests where limitations were identified, a dilution requirement ranging from no dilution to eightfold dilution was calculated. In seven of the eight tests where limitations were identified, a dilution of less than 3.5 was needed to meet the 48-hour survival criterion. It must be noted that the exposure of aquatic organisms to stormwater discharges from Logan Airport is significantly less than 48 hours. During storm events, discharges are typically limited to a 3-hour period and storms themselves are episodic while the criterion reflects an assumption of continuous exposure of a constant intensity. Section 4.0 presents the results of hydrodynamic modeling that further defines actual exposure potential in the receiving waters.

4.0 Assessment of Receiving Water Impacts

A dilution model was developed for the North, A21, and West Outfalls to examine discharge plume characteristics associated with deicing events. The North and A21 outfalls are adjacent to tidal flats. At low water, a flow channel crosses the tidal flat and significant dilution may not occur until the effluent reaches deeper water. As the tide elevation increases, a greater portion of the dilution would occur over the tidal flats. In the Phase I report, the EPA CORMIX model was used for all three outfalls. For the Phase II report, CORMIX was not considered adequate to properly represent the dynamics associated with the tidal flats and the resultant spatial plume.

Therefore, a two-dimensional (2-D) hydrodynamic model was used at outfalls North and A21. It was initially proposed to continue to use CORMIX at the West Outfall. However, since the discharges associated with the deicing events are not continuous, typically occurring during the lower portion of the tidal cycle, a three-dimensional (3-D) hydrodynamic model was used to provide a more realistic representation of the West Outfall. In both the 2-D and 3-D models a time-series of tide elevations and discharge flows are input and the model calculation steps through several tidal cycles. At outfalls North and A21, a 2-D model (vertically mixed) was considered adequate because the plume dynamics of interest primarily take place in shallower depths over the tidal flats. At Outfall West, the buoyant effluent becomes a surface plume discharged out over deeper water, necessitating the use of a 3-D model.

4.1 Mixing Zone Modeling Methods

4.1.1 North and A21 Outfalls

At North and A21 outfalls, the U.S. Army Corps of Engineers models RMA2 (hydrodynamics) and RMA4 (water quality) were used. These models were executed within the framework provided by the Surfacewater Modeling System (SMS). SMS provides a graphical pre- and post-processor. For each discharge event of interest, RMA2 simulated a 2.5- to 3-day period. The model was executed using a 6-minute time step. The output file from RMA2 is used as an input file to RMA4. RMA4 was executed with a 100 unit conservative tracer assigned the discharge flow. RMA4 was also executed with 6-minute time step, and output at each model node was saved at a 30-minute interval.

At North and A21, bathymetric data for model setup utilized 3 sources:

- NOAA Survey data,
- Massport elevation data, and
- Tidal flat survey performed by Bryant & Associates in 2009 for this evaluation.

NOAA bathymetric data were available electronically from their web site (<http://woodshole.er.usgs.gov/pubs/of2006-1008/html/appendix1.html>) for a survey performed in 2006. This data set included the main Boston Harbor channel, Winthrop Bay, and the embayment wrapping around the north side of Logan to outfall North. The NOAA data set was confined primarily to the deeper channel with depths primarily greater than 18 ft. A data set was obtained from Massport that included the shoreline regions and a number of spot elevations out on the tidal flats. In April 2009 Bryant & Associates conducted a bathymetric survey of the tidal flat in the vicinity of outfalls North and A21. This survey focused on the discharge channel leading across the tidal flats with the collection of spot elevations along the channel centerline and along the top of bank. The Bryant survey was conducted at low water to allow maximum physical access to the site.

The RMA2 model assigns elevations by importing the data as a scatter point file and interpolating between data points to each model node. It was necessary to increase the data density along the channel so that the interpolation process would not lose the channel detail. The Bryant data were used to construct a channel centerline elevation profile as a function of distance from the outfall. The top of bank data were used to describe a channel cross-sectional profile at known distances from the outfall. Using the centerline and cross-sectional profile relationships,

a computer algorithm generated additional elevation data points at 10-ft intervals along the channel. Each additional 10-ft interval data set consisted of a left/right top of bank, left/right toe of bank, and centerline elevation. This generated data set was added to the three datasets described above, and the combined file was imported into RMA2 for the assignment of an elevation to each model node. Water depths for both the North and A21 models were conservatively truncated at 20 ft (mean low water [MLW]) to limit the vertical mixing that could occur in the portion of the plume extending beyond the tidal flats.

At both North and A21 outfalls, a much finer model grid was used along the channel to provide increased spatial resolution. The RMA2 model grid for North Outfall is provided in Figure 4.1-1. For the North Outfall, a tidal boundary was applied at the north end of the model grid. The North Outfall model consisted of 1,898 cells and 4,610 nodes.

The RMA2 model grid for Outfall A21 is provided in Figure 4.1-2. The Outfall A21 grid includes a simplified one-dimensional (1-D) region extending around the north end of the runways. This 1-D region provides for representation of the intertidal volume beyond Winthrop Bay along the embayment leading to the North Outfall. For the A21 model, a tidal boundary was applied at the south boundary to Winthrop Bay. The tidal flow in and out of the extended 1-D region provides for an appropriate flow back and forth in front of Outfall A21. The A21 model consisted of 3,340 cells and 8,340 nodes.

4.1.2 West Outfall

The Environmental Fluid Dynamics Computer Code (EFDC) model, which was developed by researchers at the Virginia Institute of Marine Science (VIMS) and further refined by U.S. EPA and Tetra Tech, was used for the West Outfall. The current version of the model is EFDC U.S. EPA Version 1.01 (Tetra Tech 2007).

The West Outfall is a box culvert with a width of 10 ft and a height of 12 ft. The invert elevation of the culvert is at -4.1 ft relative to MLW. The top of the culvert is at 7.9 ft MLW, an elevation somewhat below high tide. Outflows during modeled deicing events were always in the lower half of the tide cycle when the culvert would be running partially full.

The discharge from West Outfall is buoyant, resulting in a surface plume. The buoyancy results from the density difference between the effluent and receiving water, which during winter deicing events is dominated by salinity. The salinity of the effluent is typically 2.5-3.5 ppt while the receiving water is 28-30 ppt.

A 3-D model is more computationally intensive than a 2-D model. The computational time step needed for model stability is dependent on several factors including the model cell size, longitudinal velocity, and vertical processes. The model run time is also proportional to the total number of cells.

The channel adjacent to West Outfall is approximately 2,950 ft wide. To help reduce the total number of cells in the model, the model domain extended only to the channel centerline. In the far field a 250-ft by 410-ft cell size was used. Model stability could not be achieved while transitioning between the far field and a 10-ft cell size at the discharge (the width of the box culvert). Stability was obtained using a 2-second time step and a 50-ft discharge cell width. The increased cell width was compensated for by a reduced vertical dimension. The West discharge flow was confined primarily to a 0.5-ft surface layer such that the MLW discharge port area was

25 square feet (ft²) (0.5 ft by 50 ft). The actual West Outfall discharge area was 41 ft² (4.1 ft by 10 ft). It is considered likely that density stratification would take place within the mouth of the culvert such that the effective discharge port area would be less than 41 ft².

The EFDC model grid used at West Outfall is illustrated in Figure 4.1-3. Each model cell contained six vertical layers. Depths in the channel extend up to approximately 30 ft. Because the surface plume does not interact with the lower column, and to provide increased vertical resolution in the model, the modeled depth was truncated at 20 ft. In EFDC, each layer is a fixed fraction of the total water depth. The thickness fraction assigned to each layer is as follows:

Layer	Fraction	Layer Thickness (ft) at MLW	
		10-ft Shoreline	20-ft Channel
1 Surface	0.05	0.5	1.0
2	0.10	1.0	2.0
3	0.15	1.5	3.0
4	0.20	2.0	4.0
5	0.25	2.5	5.0
6 Bottom	0.25	2.5	5.0

At MLW the model depth in a shoreline cell was 10 ft, increasing to 20 ft in the channel. The corresponding MLW layer thickness is indicated in the above table. As the water depth increases towards high tide, each layer thickness increases proportionately.

The EFDC model was executed with a tide elevation boundary at the downstream (sea-ward) end and a flow boundary at the upstream end. The tide boundary for each flow event was based on the observed 15-minute NOAA tide data for Boston Harbor. The flow time-series applied at the upstream boundary was determined for each event using a tidal prism model. The surface area of Boston Harbor upstream of the West Outfall was determined by planimetry of the NOAA navigational chart (Chart 13273). The tidal prism model used the upstream surface area in conjunction with the 15-minute time-series NOAA tide data. At each time step, the change in tide elevation was used to calculate the corresponding change in the upstream tidal prism volume (area x delta height). The change in volume was divided by the tide adjusted cross-sectional area of the Boston Harbor Channel adjacent to the West Outfall to provide a cross-sectional average velocity. The resulting velocity time-series was applied to the cross-sectional area represented by the model to provide a flow time-series for use at the upstream model boundary.

4.2 Mixing Zone Modeling Results

The dilution models developed for each of the three outfalls were executed using measured flow data from deicing events during winter 2008-2009. For each outfall, the model was executed for three events. The events were selected based on the availability of collected chemistry and toxicity data that was discussed in Section 3. The modeled events are indicated in the following table.

Event	North	A21	West
19-21 December 2008			X
10-13 January 2009	X	X	X
28-30 January 2009	X	X	X
1-3 March 2009	X	X	

At Outfalls North and A21, the RMA2 model was started at high tide during the previous tidal cycle to the initial collection of chemistry/toxicity data. The EFDC model at Outfall West was started at the previous low tide. Each model scenario was executed for 60-72 hours (2.5-3.0 days). As discussed in the previous section, the model used 15-minute discharge flow and tide elevation data. The discharge flows were those measured by Flow Assessment Associates, and the observed NOAA Boston tide data was used. Plume areas and maximum radial extensions for the 2, 5, 10, and 20 dilution contours are provided in figures and tables as follows:

- North Outfall: Figures 4.2-1 to 4.2-6, Tables 4.2-1 to 4.2-3
- A21 Outfall: Figures 4.2-8 to 4.2-13, Tables 4.2-4 to 4.2-6
- West Outfall: Figures 4.2-15 to 4.2-20, Tables 4.2-7 to 4.2-9

Each figure has two sets of axes: plume area/distance on the top axis and discharge flow and tide elevation on the bottom axis.

At all three outfalls, the largest discharge flow event was associated with January 28-29, 2009. Snap shots of the 2 and 5 dilution contours at 1- to 2-hour intervals during the maximum flow event are provided in Figure 4.2-7 at North Outfall, Figure 4.2-14 at A21 Outfall, and Figure 4.2-21 at West Outfall.

4.2.1 Results at North Outfall

North Outfall: January 11-13, 2009

During January 11-12, 2009, there was a 2- to 3-hour discharge starting at mid-ebb tide. During early afternoon of January 11, the peak was 18 cfs, decreasing to 7 cfs in the early morning of January 12 (Figure 4.2-1). The 2 and 5 dilution contours had maximum areas of typically 6,000 and 28,000 ft², respectively (Table 4.2-1). Maximum areas were associated with low tide, and the 2 and 5 dilution contour areas would go to zero at high tide. Maximum radial plume distance was associated with maximum area at low tide. The radial dimension of the 2 dilution contour did not exceed 150 ft, while the 5 and 10 dilution contours extended 600-900 ft, the majority of the distance across the tidal flat to deeper water.

North Outfall: January 28-29, 2009

During January 28, 2009, there was a 6.5-hour discharge starting at mid-ebb tide during the afternoon, peaking at 28 cfs (Figure 4.2-3). The following two tidal cycles had 3- to 4-hour duration discharges peaking at 9-10 cfs. For the larger discharge event, maximum plume areas of 348,500 and 553,500 ft² for the 2 and 5 dilution contours occurred during early flood tide, and these area contours were back to zero by high tide (Figure 4.2-3, Table 4.2-2). During the following tidal cycle, the maximum 2 and 5 dilution areas were only 4,600 and 27,400 ft². With

the larger discharge flows, the 2 dilution contour extended across the majority of the tidal flat. The maximum radial distance of the 2 and 5 dilution contours was 876 and 977 ft at low water, and decreased back to zero during each following high tide.

Snap shots of the 2 and 5 dilution contours on January 28 are displayed in Figure 4.2-7. At 1700 hours, approximately 1 hour into the event, the 2 dilution contour is confined to the channel crossing the tidal flat during late ebb. At 2000 hours, early flood, the plume is beginning to be pushed back up the channel. By 2100 and 2200 hours, the tide elevation has risen above the channel banks and the plume is being pushed back onto the marsh. By 2300 hours (not shown), the discharge has ended and the remnant 2 dilution contour has dispersed.

North Outfall: March 2, 2009

On March 2, there was a 1.5- to 2-hour discharge occurring at mid-ebb tide during mid-morning (30 cfs) and mid-afternoon (20 cfs) (Figure 4.2-5). The 5 dilution contour area did not exceed 21,000 ft² and decreased back to zero for an 8-hour period preceding the discharge event during the following tidal cycle (Figure 4.2-5, Table 4.2-3). The 2 dilution contour did not exceed 100 ft and the 5 dilution contour did not exceed 226 ft, less than one-quarter of the distance across the tidal flat.

4.2.2 Results at Outfall A21

Outfall A21: January 11-12, 2009

During January 11-12, there was a 1-1.5 hour discharge occurring at mid-ebb tide with flows of 4-6 cfs for five sequential tidal cycles (Figure 4.2-8). Following each peak, the flow trailed off to 0.1-0.2 cfs until approaching the next high tide. The 2 and 5 dilution contours typically reached maximum areas of 45,000 and 100,000 ft² at low water, and decreased back to zero at high water (Figure 4.2-8, Table 4.2-4). The maximum radial distance of the 2 dilution contour was typically 1,000 ft at low tide. This distance is approximately 60 percent of the width of the tidal flat. The 5 dilution contour distance approached 1,800 ft, approximately the distance to deeper water.

Outfall A21: January 28-29, 2009

A discharge event started during the afternoon of January 28, peaking at 6 cfs, and displayed a recession hydrograph for the following 2 days, decreasing to below 1 cfs (Figure 4.2-9). The recession curve was interrupted for several hours at each high water (zero flow) and then continued. Near low tide following the 6 cfs flow peak (January 29 at 0900 hours), the 2 and 5 dilution contours reached maximum areas of 153,700 and 296,200 ft² (Figure 4.2-9, Table 4.2-5). The 2 and 5 dilution contours at near low-tide reached maximum radial dimensions of 1,540 and 1,811 ft. Near high water the radial dimension for the 2 dilution contour decreased to 250 ft.

Snap shots of the 2 and 5 dilution contours on January 29 are provided in Figure 4.2-14. At 0600 hours, the 2 and 5 dilution contours are confined to the channel crossing the tidal flat, the 2 contour extending 1,240 ft and the 5 contour 1,811 ft. At 0800 and 1000 hours the plume is being pushed back up onto the tidal flats. The discharge channel is still evident and the location where the 5 dilution contour broadens out indicates the current location of the shoreline resulting

from the rising tide. At 1200 hours, the dilution contours are very small and coincide with a lull in the discharge flow at high tide.

Outfall A21: March 2-3, 2009

During March 2-3, there was a 1- to 1.5-hour discharge flow of 3-4 cfs occurring at mid-ebb tide during each tidal cycle (Figure 4.2-10). Following each peak, the flow trailed off to 0.1-0.2 cfs until approaching the next high tide. Maximum near low water plume areas did not exceed 37,300 and 50,300 ft² for the 2 and 5 dilution contours, and decreased to zero at high tide (Figure 4.2-10, Table 4.2-6). The maximum low tide radial dimensions were typically 1,000 ft for the 2 dilution contour and 1,200-1,300 ft for the 5 dilution contour. These areas/distances correspond to a plume confined the channel crossing a portion of the tidal flat.

4.2.3 Results at West Outfall

At the West Outfall, the occurrence of discharge flow was more associated with low water, rather than the frequently occurring mid-ebb discharges at Outfalls North and A21. The resulting plumes in the Boston Harbor channel quickly developed and dissipated soon after the outfall flow started and stopped.

West Outfall: December 20-21, 2008

During December 20-21, discharge flows of 40-68 cfs were present at West Outfall for a 2- to 3-hour period at low tide (Figure 4.2-15). The maximum flow of 68 cfs occurred near noon on December 20. The maximum area of the 2 and 5 dilution contours for the 68 cfs flow event were 6,600 and 99,000 ft² (Figure 4.2-15, Table 4.2-7). The corresponding plume dimensions were 81 and 1,165 ft for the 2 and 5 dilution contours.

West Outfall: January 11-12, 2009

During the afternoon of January 11, there was a 3-hour duration discharge with a peak flow of 64 cfs, followed by 23-34 cfs discharges during the next two low tides (Figure 4.2-17). The maximum area of the 2 and 5 dilution contours for the 64-cfs event were 14,900 and 76,000 ft² (Figure 4.2-17, Table 4.2-8). The corresponding plume distances were 152 and 683 ft for the 2 and 5 dilution contours. Similar to December 20-21, there were 9- to 10-hour periods of zero area/distance for the 2-20 dilution contours between discharge events.

West Outfall: January 28-29, 2009

For a 5-hour period starting at mid-ebb tide there was a discharge during the afternoon of January 28, and during the following ebb tide on the morning of January 29 (Figure 4.2-19). Peak discharge flows were 117 cfs on January 28 and 91 cfs on January 29. The maximum areas of the 2 and 5 dilution contours for the 117 cfs event were 9,900 and 215,700 ft² (Figure 4.2-19, Table 4.2-9). The corresponding plume distances were 99 and 1,797 ft for the 2 and 5 dilution contours.

Snap shots of the 117 cfs discharge flow event on January 28 are provided in Figure 4.2-21. In this figure, the boundary on the right side of Boston Harbor channel represents the channel half-width. At 1630 hours, discharge flow has been present for ½ hour and the plume is developing. At 1700 hours the plume is extending downstream during a late ebb tide. At 1900 hours, near low water, the plume is concentrated near the discharge, and by 2200 hours, the discharge has stopped and the plume quickly dissipates.

4.3 Dissolved Oxygen Model of Winthrop Bay

A model was developed for Winthrop Bay to examine the response of DO in the receiving water to discharges from Outfalls North and A21 during deicing events. The resulting discharge plumes are buoyant due to the density differences between the effluent and the highly saline receiving water. In order to represent the vertical structure, a 3-D hydrodynamic model was needed. The EFDC model, the same model used for mixing zone dilution at Outfall West, was used. The model includes water quality parameters allowing the COD and ammonia from the deicing events to be represented.

4.3.1 Dissolved Oxygen Modeling Methods

The EFDC model grid for Winthrop Bay (1,066 cells) is illustrated in Figure 4.3-1. The model grid did not extend into the higher elevations along the tidal flats because wetting and drying of these regions was not incorporated into the model. The bathymetry data for assigning depths within the model were the same as discussed in Section 4.1 for the mixing zone modeling including data from NOAA, Massport, and Bryant & Associates. A minimum mean low water depth of 1 ft was maintained in the regions of the model extending onto the tidal flats. Each EFDC model cell contained six vertical layers with total water depth fractions of 0.08, 0.14, 0.18, 0.20, 0.20, and 0.20, from surface to bottom. At the Winthrop Bay tidal boundary with the Boston Harbor channel, the 15-minute Boston Harbor NOAA tide data was applied.

The discharge flows and mass loadings of COD and ammonia were based on observed values during the Winter 2008-2009 monitoring program. The 15-minute discharge flows were those measured by Flow Assessment Associates. The COD and ammonia data were based on the hourly grab samples collected during the deicing events. Adequate chemical data existed for December 19-20, 2008, January 11-12, 2009, and January 28-29, 2009 events. The hourly COD and ammonia data were interpolated to assign a concentration to each 15-minute interval corresponding to the flow time-series. Field discharge DO data recorded during deicing events was not judged reliable. DO was measured in the laboratory on effluent samples collected for toxicity testing. Based on the laboratory results, a 4.0 mg/L DO concentration was assumed for both Outfalls North and A21 in the model. Each model run started at low tide on the tide cycle preceding the event and continued for 10 days. A 20-second time step was used in the model with output at 30-minute intervals.

Background DO, ammonia, and temperature values in the model were initially based on MWRA data collected at Station 130 in Winthrop Bay. Temperature and salinity data were available from 1998 to 2007. DO and ammonia data were used starting in 2001, following the Deer Island Sewage Treatment Plant coming online in late 2000. A personal communication with MWRA indicated that background BOD5 values in the vicinity are approximately 1.0 mg/L. Monthly averages of surface and bottom values of the MWRA data are provided in the following table for December and January. These data indicate that the water column is well mixed.

Depth	December				January			
	DO (mg/L)	NHx (mg/L)	Temp (°C)	Salinity (ppt)	DO (mg/L)	NHx (mg/L)	Temp (°C)	Salinity (ppt)
Surface	9.66		3.05	31.07	10.58		1.31	30.86
Bottom	9.44		3.29	31.08	9.70		1.69	31.26
Average	9.55	0.02	3.17	31.07	10.17	0.02	1.49	31.06

The model was initially executed to examine the response of Winthrop Bay to ambient conditions with the assumption that a 9.6 mg/L DO in December and a 10.2 mg/L DO in January were in equilibrium with the environment. Model runs with no discharges present and using the above background concentrations resulted in the DO concentrations increasing by up to 1.0 mg/L over several days. Re-aeration in the model used the O'Connor-Dobbins formulation. This method is recommended by EPA for low to moderate velocities and water depths greater than 2 ft (U.S. EPA 1985). The significant increase in water column DO over several days in an ambient run resulted from insufficient DO demand to counteract the re-aeration rate. Rather than modifying the O'Connor-Dobbins re-aeration rate, the background water column DO demand was increased. A background ammonia concentration of 0.05 mg/L was used along with a COD of 8 mg/L. The ambient temperature was also increased to 5.0°C to decrease the 100 percent DO saturation value that the re-aeration rate was driving the water column towards. With these modifications, although there was still a very slight increase in Winthrop Bay DO levels during an ambient run, the system was in reasonable equilibrium with the 9.6 mg/L December DO levels. During this ambient exercise, it was also learned that the model uses only a four-character field to output DO concentrations. Concentrations above 10.0 display only one decimal place, while lower concentrations (i.e., 9.60) display two decimal places. To provide smoother model graphics, the 9.6 mg/L December concentration was also used for January.

The buoyancy of the discharge plume was represented in the model as a density difference. The density of sea water at 31 ppt salinity and 2-5°C is approximately 1,025 kilograms per cubic meter (kg/m³). The density of the effluent is in the range of 1,010-1,015 kg/m³ based on conductivity and temperature measurements. A density difference of 6 kg/m³ was employed in the model to represent the buoyant discharge.

In summary the Winthrop Bay DO model used the following parameters:

- Tide: 15-minute NOAA Boston Harbor data
- DO at tidal boundary and background: 9.6 mg/L
- Ammonia at tidal boundary and background: 0.05 mg/L
- COD at tidal boundary and background: 8 mg/L
- Temperature at tidal boundary and background: 5.0°C
- Discharge DO concentration: 4 mg/L
- Discharge COD and ammonia: 15-minute time-series using observed data

The model was executed for a 10-day period associated with three deicing events during the winter of 2008-2009. Each model scenario started at low tide during the previous tidal cycle. Model output displayed in the resulting figures starts at time zero. The starting times for each run (corresponding to zero time in report figures) are as follows:

- December 19, 2008 event: start December 18, 2200 hours
- January 11, 2009 event: start January 10, 1700 hours
- January 28, 2009 event: start January 27, 1800 hours

The total COD and ammonia nitrogen loadings for Outfalls North and A21 during the three events are tabulated in the following table.

Event	COD (kg)		Ammonia-N (kg)	
	North	A21	North	A21
December 19, 2008	17,182	260.5	3.76	1.91
January 11, 2009	20,870	201.4	7.71	9.96
January 28, 2009	36,269	2,145.6	29.9	47.0

4.3.2 Dissolved Oxygen Modeling Results

The EFDC model outputs water quality data only at designated cells. The 14 model cells designated for the Winthrop Bay DO modeling scenarios are illustrated in Figure 4.3-1. Stations were selected along the centerline of the channel through Winthrop Bay and near Outfalls North and A21. Stations 1 and 2 are the first and second adjacent cells to Outfall North, and Stations 10 and 11 are the first and second adjacent cells to Outfall A21.

In general, the 4.0 mg/L DO effluent concentration caused a significant decrease in surface DO concentrations, particularly near Outfall North. Following the deicing event, these low DO concentrations were quickly diluted. The model cells containing Outfalls North and A21 both had MLW depths of approximately 1 ft. Thus, the surface layer (0.08 depth fraction) would vary from approximately 0.1 to 1 ft between low and high water. On the tidal flats near Outfalls North and A21, a water column average DO concentration is considered more representative of existing conditions. Post event and away from the outfalls, surface DO concentrations were frequently slightly higher due to re-aeration. For this situation, a water column average DO would also be more representative.

December 19, 2008 Deicing Event

DO modeling results for the December 19, 2008 event are provided in Figures 4.3-2 to 4.3-4. Figures 4.3-2 and 4.3-3 provide water column average DO concentrations at the two stations adjacent to Outfalls North and A21, respectively. These figures also include the lower surface DO concentration at the station closest to the outfall. At Outfall North (Figure 4.3-2), the water column average DO decreased to 8.2 mg/L, a deficit of 1.4 mg/L relative to the initial 9.6 mg/L concentration. The lower surface DO concentration decreased to 7.6 mg/L. These lower concentrations existed for less than 12 hours. Within 1 day following the event, both surface and water column average DO concentrations were above 9.0 mg/L. At Outfall A21 (Figure 4.3-3), a

DO sag associated with the discharge event was not noticeable. This results from the lower flows and mass loadings, and greater flushing potential due to its closer proximity to the tidal boundary. DO concentrations at stations along the centerline of Winthrop Bay are provided in Figure 4.3-4. The depressed DO concentrations from Outfall North affected Station 4 one day following the event. The remaining stations are generally above a DO of 9.3 mg/L and are making a slow recovery back to the 9.6 mg/L baseline.

January 11, 2009 Deicing Event

DO modeling results for the January 11, 2009 event are provided in Figures 4.3-5 to 4.3-7. Figure 4.3-5 and 4.3-6 provide water column average DO concentrations at the two stations adjacent to Outfalls North and A21, respectively, and also include the lower surface DO concentration at the station closest to the outfall. At Outfall North (Figure 4.3-5), the water column average DO decreased to 8.6 mg/L, a deficit of 1.0 mg/L relative to the initial 9.6 mg/L concentration. The lower surface DO concentration decreased to 8.0 mg/L. These Outfall North lower concentrations were associated with three short duration outflows at mid ebb on sequential tidal cycles. Within 1 day following the event, both surface and water column average DO concentrations were above 9.0 mg/L. At Outfall A21 (Figure 4.3-6), similar to the December 2008 event, a DO sag was barely noticeable. DO concentrations at stations along the centerline of Winthrop Bay (Figure 4.3-7), generally remained above a DO of 9.5 mg/L.

January 28, 2009 Deicing Event

DO modeling results for the January 28, 2009 event are provided in Figures 4.3-8 to 4.3-10. At Outfall North, the COD loading during the January 28 event was 50 percent higher and the ammonia loading 10 times higher than the two earlier events. Figures 4.3-8 and 4.3-9 provide water column average DO concentrations at the two stations adjacent to Outfalls North and A21, respectively, and also include the lower surface DO concentration at the station closest to the outfall. At Outfall North (Figure 4.3-8), the water column average DO decreased to 7.7 mg/L, a deficit of 1.9 mg/L relative to the initial 9.6 mg/L concentration. The surface DO concentration at Outfall North decreased to 5.2 mg/L and was below 6.0 mg/L for approximately 3 hours. These lower DO concentrations occurred at low tide in the middle of the discharge event and reflect the effect of DO at 4.0 mg/L in the discharge. The lower 60 percent of the water column remained above an 8.0 mg/L DO concentration. Within 1 day following the event, both surface and water column average DO concentrations were above 8.5 mg/L. At Outfall A21 (Figure 4.3-9), a DO deficit of up to 0.6 mg/L (9.0 mg/L) was present during the discharge event. In subsequent days, lower DOs are present due to longitudinal dispersion from the vicinity of North Outfall. DO concentrations at stations along the centerline of Winthrop Bay are illustrated in Figure 4.3-10. A longitudinal DO gradient is established from the head of Winthrop Bay near Outfall North and the tidal boundary, which is fixed at 9.6 mg/L during each flooding tide. The back and forth movement of this gradient with the tide causes varying DOs at the centerline stations. In the upper reach of Winthrop Bay (Station 4), minimum DOs remain at approximately 8.7 mg/L (0.9 mg/L DO deficit) for 6-7 days following the discharge event while the DO demand of the COD is being exerted. Following this period (days 8 and 9 in Figure 4.3-10), the water column DO increases strongly as the re-aeration term begins to dominate the decreasing COD demand.

5.0 Conclusions

This report presented the results of the Logan Airport Water Quality Deicing Impacts Study that was conducted to satisfy the requirements in Section D.1, Water Quality Study, in National Pollutant Discharge Elimination System (NPDES) Permit No. MA0000787, issued to the Massachusetts Port Authority (Massport) and Co-Permittees of Boston Logan International Airport (Logan Airport) in 2007. The overall goal of the study was to conduct a “biological, chemical, and toxicological analysis of Logan Airport’s stormwater discharges and the resultant receiving water quality in order to characterize the impacts of deicer contained in stormwater discharges.” The permit language further relates the characterization of impacts to an assessment “of the ability of the receiving waters to meet their designated uses, including an assessment of impacts to aquatic life and fishing, shellfishing and recreation.” Based on the analyses conducted in this water quality study, the following conclusions were reached:

- The discharge of stormwaters containing deicing materials does not negatively impact receiving water dissolved oxygen concentrations;
- The stormwater discharges do not contain materials in concentrations in excess of established water quality criteria or available toxicity benchmarks; and
- Aquatic toxicity in the discharges does not adversely affect the designated uses (SB, SB/CSO) of the receiving waters.

Specific requirements of Section D.1 and the measures and analyses that Massport undertook in the Water Quality Study to comply were summarized in Table 1-1. The water quality study included a program to collect data on deicer use including daily logging of ADF and AAF use through the period October through April. Massport also recorded use of pavement deicers during this period. Continuous monitoring of three outfalls (West, North, and A-21) for flow and other physical parameters and monitoring of three storm events using hourly (or bi-hourly) grab sampling and analyses for concentrations of deicer chemicals in surface water discharges were conducted. Hydrodynamic models were used to predict impacts on the receiving waters based on the results of the monitoring program.

5.1 Assessment of the Extent and Duration of Exposure of Aquatic Biota to Stormwater Discharges

In order to examine discharge plume characteristics associated with deicing events, dilution models sanctioned by EPA or the US Army Corps of Engineers were applied to the North, A21, and West Outfalls. The North and A21 Outfalls are adjacent to tidal flats. Each of the outfalls is regulated by tide gates which restrict discharge to the ebbing portion of the tidal cycle. The maximum areas exposed to less than twofold dilution, less than fivefold dilution, and the total duration of exposure to a detectable plume from the discharge are summarized below:

Outfall	Area Exposed to Less than Twofold Dilution	Area Exposed to less than Fivefold Dilution	Total Site-Specific Duration of Exposure to a Detectable Plume
North Outfall	8 acres	13 acres	Less than 6 hours
A-21 Outfall	4 acres	7 acres	Less than 6 hours
West Outfall	0.3 acres	5 acres	Less than 1 hour

The results of the dilution modeling clearly show that exposure to discharges from the Logan Airport stormwater system are limited in extent and even more clearly, show that the duration of exposure is intermittent and much less than the 48 hour continuous exposure period upon which water quality criteria and bioassay testing are based.

5.2 Impact on Dissolved Oxygen in Receiving Waters

The Phase 1 Study included a conservative analysis of impact of deicer fluid oxygen demand on the receiving waters and indicated that the resulting ambient DO would be in the range of 7.5 to 8.5 mg/L and would be well above the MWRA caution level of 6.5 mg/L and state water quality standard of 5.0 mg/l. While it was determined that the analysis of DO for the West Outfall receiving waters as conducted in the Phase 1 Study was sufficient, a more detailed assessment of DO impacts in Winthrop Bay was conducted to better evaluate and understand the more restricted flushing in those waters. The model simulating impact of the COD and ammonia load from stormwater discharges in the North and A-21 Outfalls on the DO concentration in Winthrop Bay was run for up to 10 days. The results show that the DO depression is less than 1 mg/L at channel centerline and in no case resulted in a DO receiving water concentration below the MWRA caution level of 6.5 mg/L.

5.3 Achievement of Designated Use for Support of Aquatic Life

The primary objective of the Water Quality Study is to determine whether the discharge of stormwater laden with deicer fluids from Logan Airport prevents the receiving waters from achieving their designated uses. The designated uses are defined by the surface water classifications. Criteria for determining whether a water body supports its designated uses are presented in the *Assessment Methodology Guidelines for Evaluating Designated Use Status of Massachusetts Surface Waters—2007* (MassDEP 2007). The Water Quality Study concludes that the discharges from Logan Airport do not adversely affect the ability of the receiving waters to achieve their designated use.

Criteria for determining whether a water body supports its designated uses are presented in the *Assessment Methodology Guidelines for Evaluating Designated Use Status of Massachusetts Surface Waters—2007* (MassDEP 2007). Table 5-1 summarizes the findings of the Water Quality Study with respect to the criteria.

These findings indicate that the discharges from the Logan Airport outfalls would not preclude the achievement of 75 percent survival in ambient waters over a 48-hour exposure period—the state criterion for determination of support of aquatic life. Evaluation of oxygen demand, ammonia nitrogen, tolyltriazole, and nonylphenol data indicate that no dilution is necessary to meet water quality criteria or toxicity benchmarks.

Boston Harbor is designated as Essential Fish Habitat for several fish species. Of particular interest in the receiving waters near Logan Airport are Atlantic cod (*Gadus morhua*) and winter flounder (*Pseudopleuronectes americanus*). Both species migrate into the shallower waters of Boston Harbor in late fall to spawn, and retreat into deeper waters during spring. Winter flounder is more likely than Atlantic cod to be affected by deicing discharge because of its preference for shallower water for spawning. The winter flounder eggs are demersal and adhesive, and could have greater exposure to the discharge, while the eggs of Atlantic cod are pelagic and would drift with the currents. However, results from the Water Quality Study indicate that neither species would be adversely affected by intermittent, short-term exposure to deicing discharge.

Based on normal distribution of federally and state-listed threatened and endangered species, it is unlikely that they would be present in significant numbers in the vicinity of Logan Airport. The Water Quality Study concludes that the discharges from Logan Airport do not adversely affect the ability of the receiving waters to achieve their designated use.

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FIGURES

Figure 1-1 Location of Logan International Airport

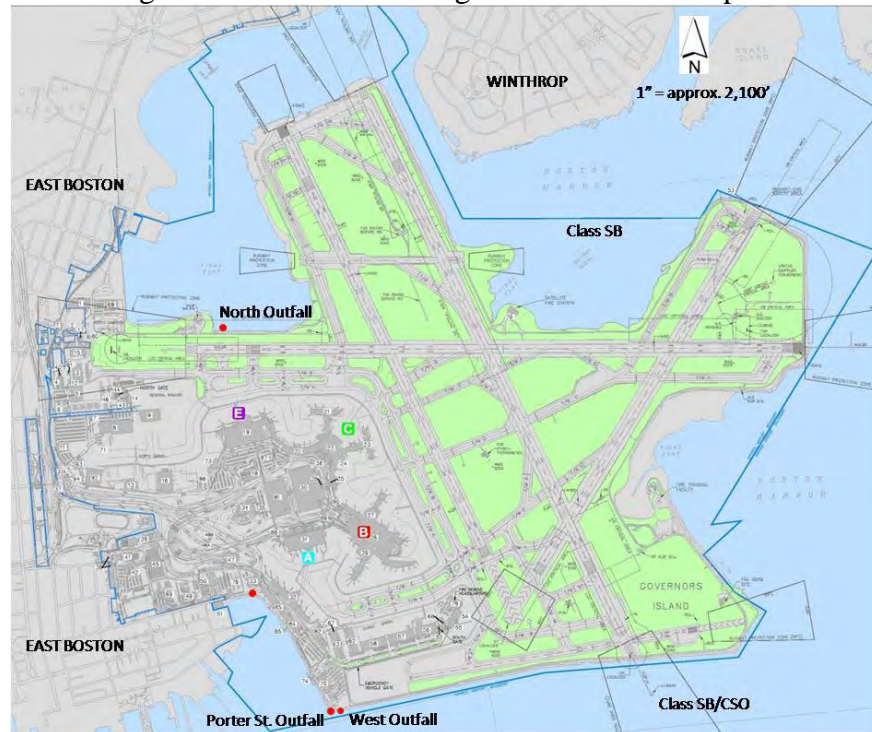


Figure 1-2 Location of Aircraft and Airfield Pavement Deicing Operations

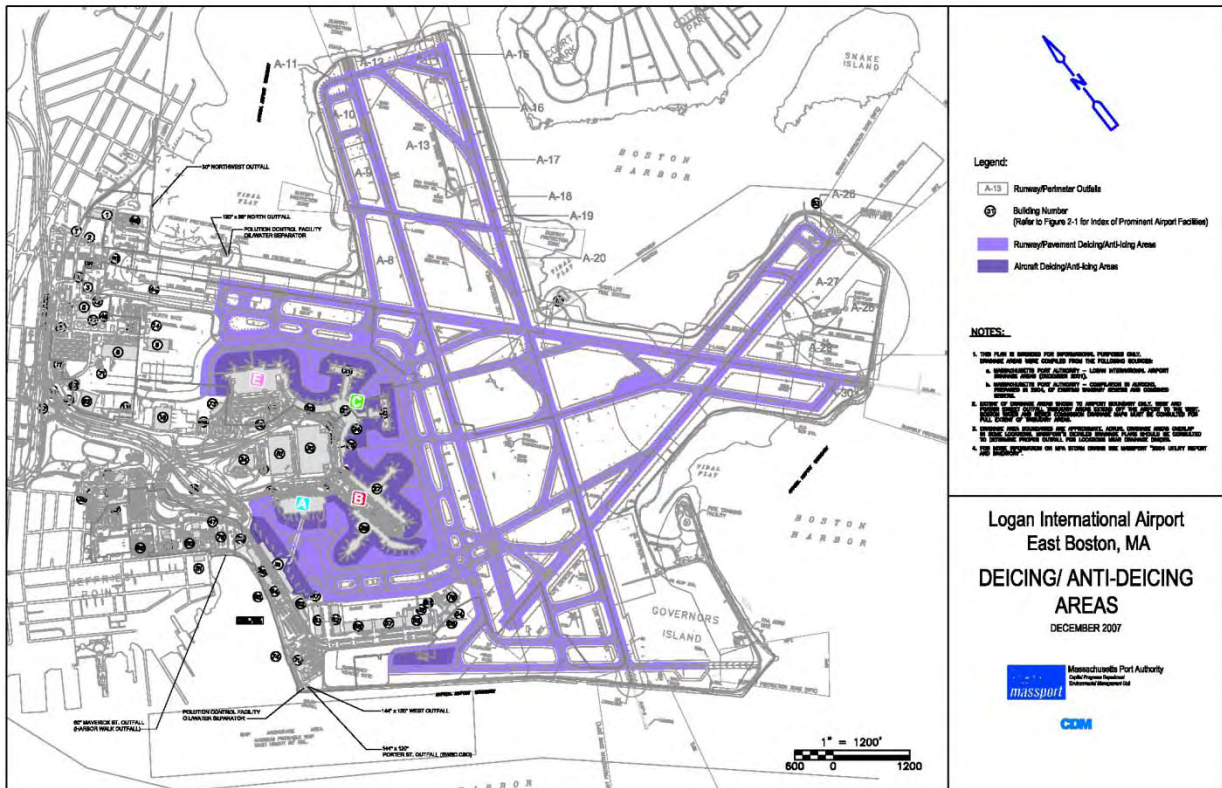


Figure 1-3 Locations of Outfalls and Associated Drainage Areas

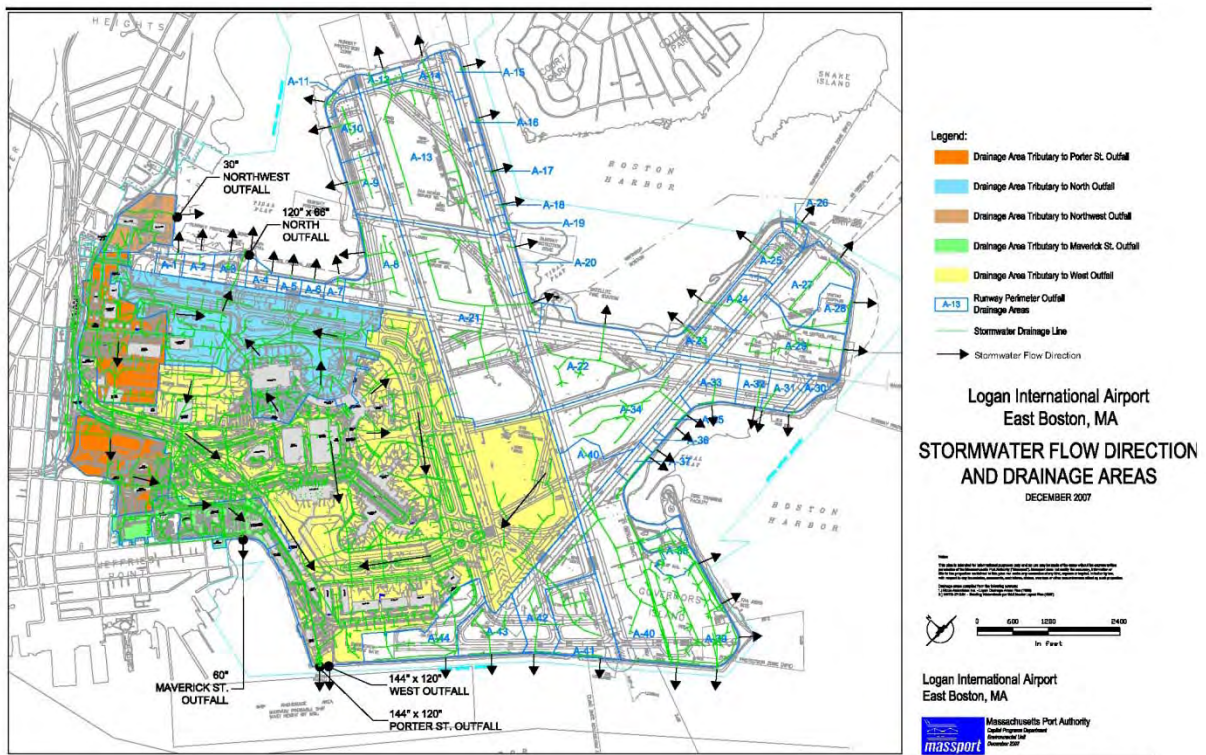


Figure 1-4 Flow Chart of the Phased Study Plan Technical Activities

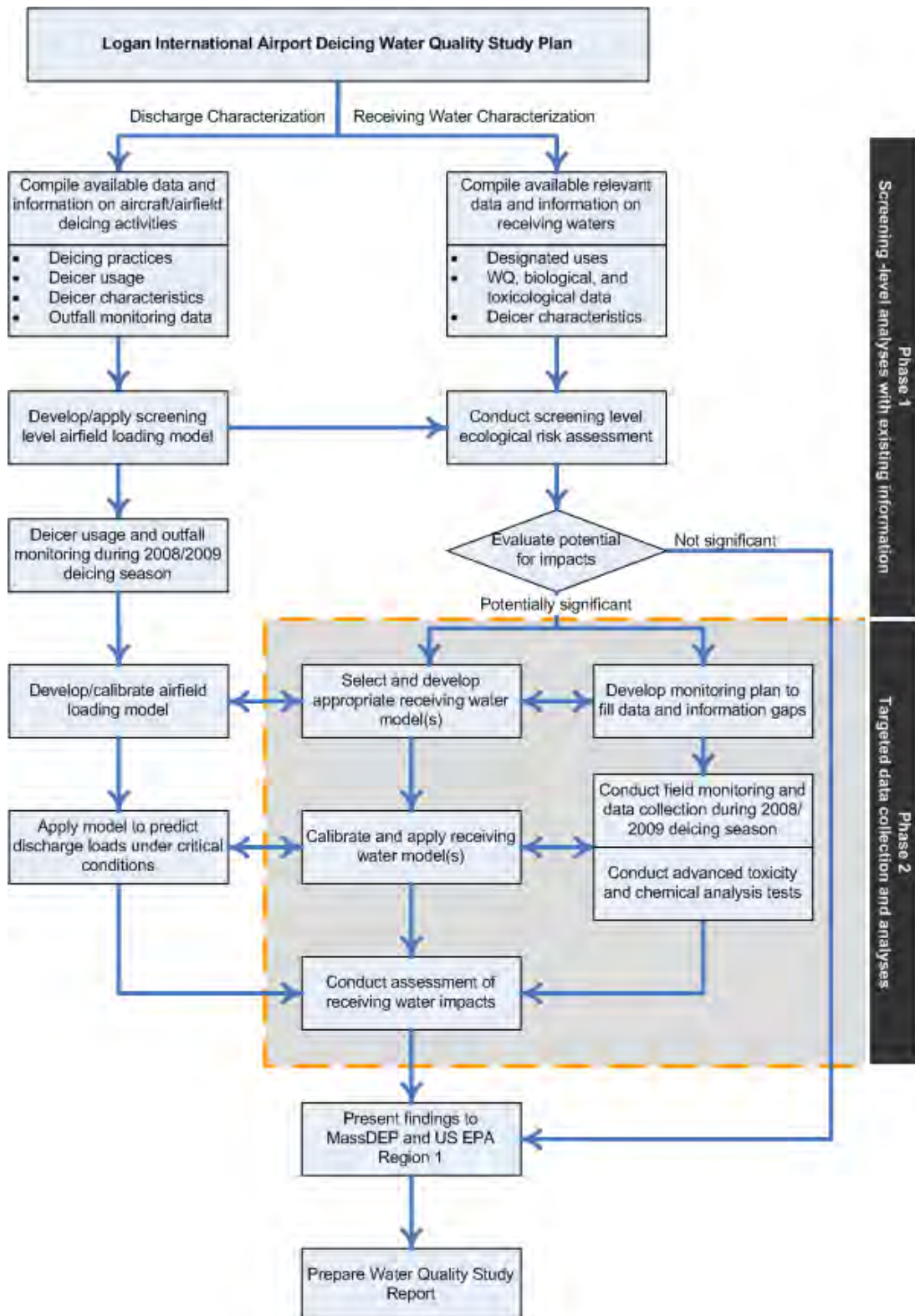
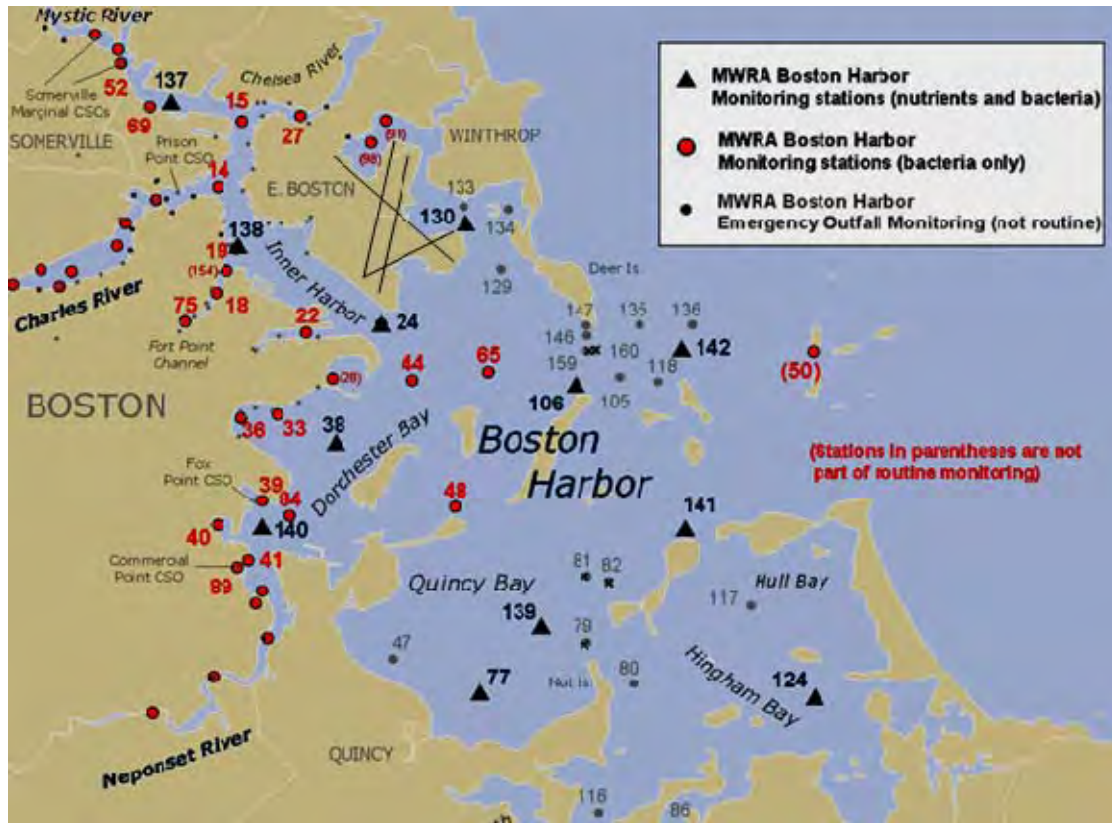


Figure 2-1 MWRA Boston Harbor Monitoring Stations



Source: MWRA website: http://www.mwra.state.ma.us/harbor/graphic/bostonharbor_800.gif

Figure 2-2 Dissolved Oxygen Trends Exhibited at MWRA Station 138 and the NEAQ Inner Harbor Station

The horizontal red line represents the caution criteria used by MWRA of 6.5 mg/L DO. Shaded bands indicate the deicing season (i.e., October – April).

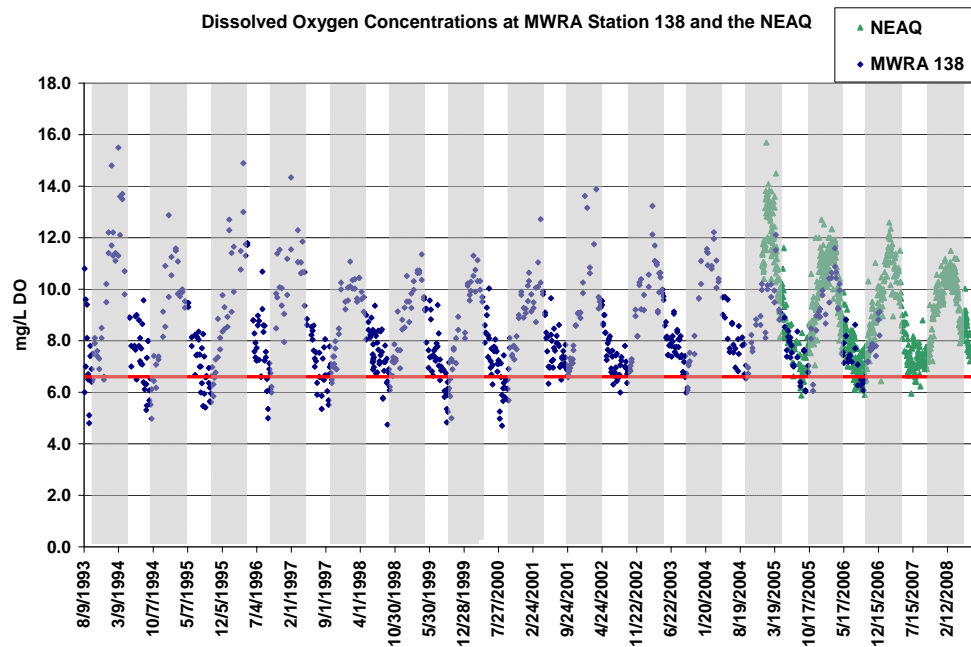


Figure 2-3 Ammonia Concentrations at MWRA Station 138

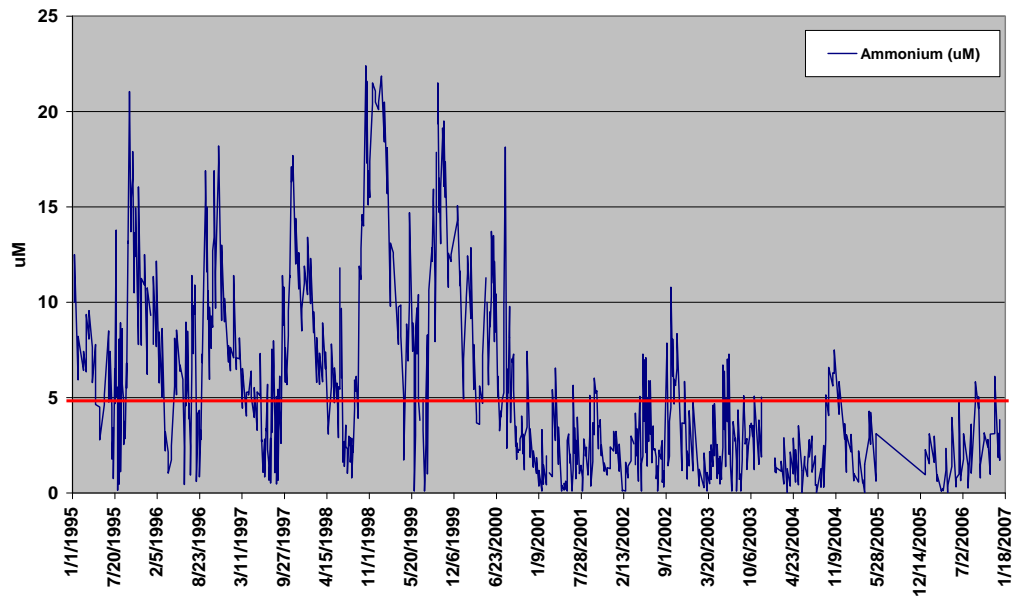


Figure 2-4 Dissolved Oxygen and Total Dissolved Nitrogen at MWRA Station 138 as a Function of Season
Shaded bands indicate deicing season (October–April).

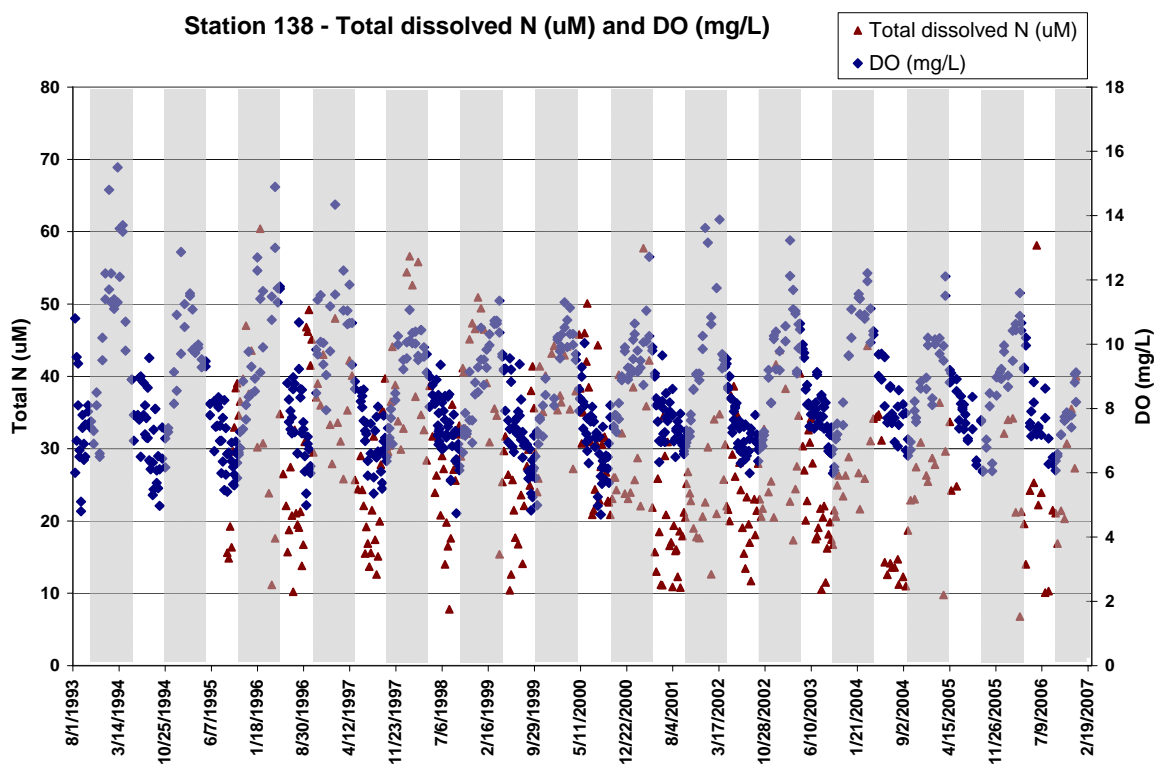
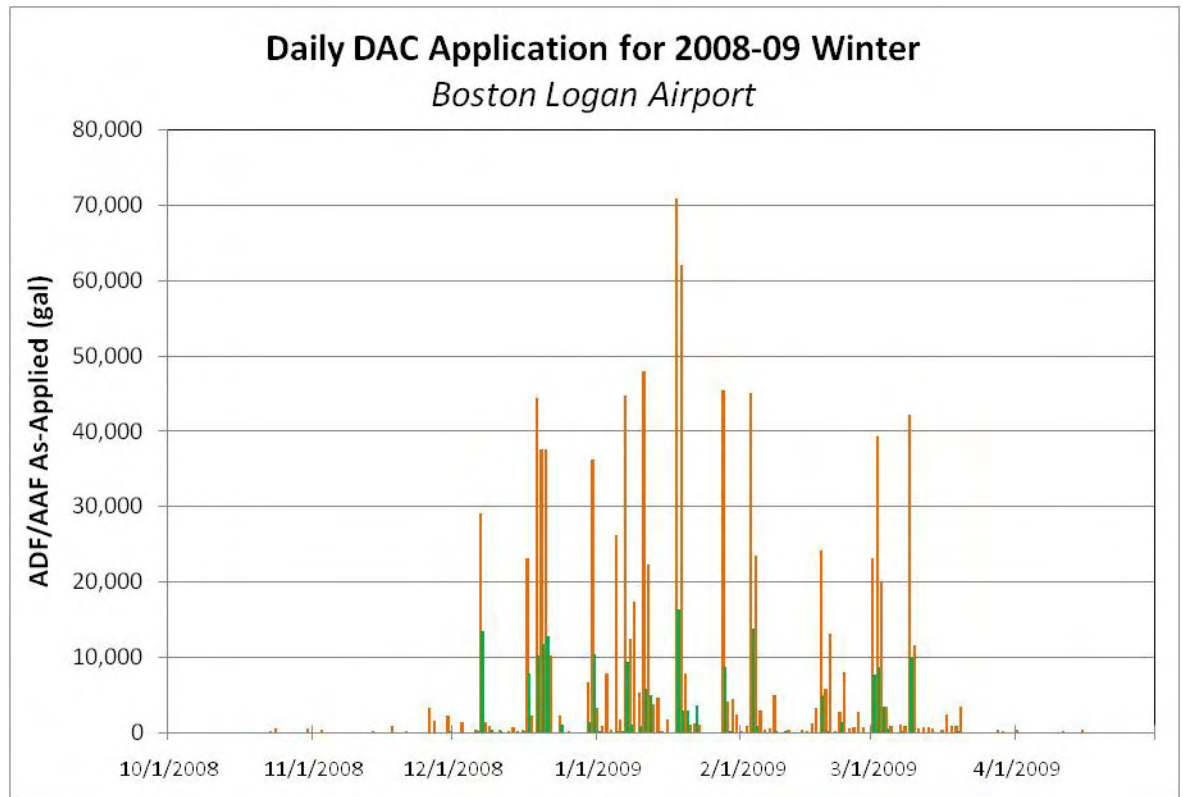


Figure 3-1 Profile of ADF/AAF Usage in the 2008-2009 Season
(Green lines are Anti-icing Fluid quantities; orange lines are de-icing fluid quantities)



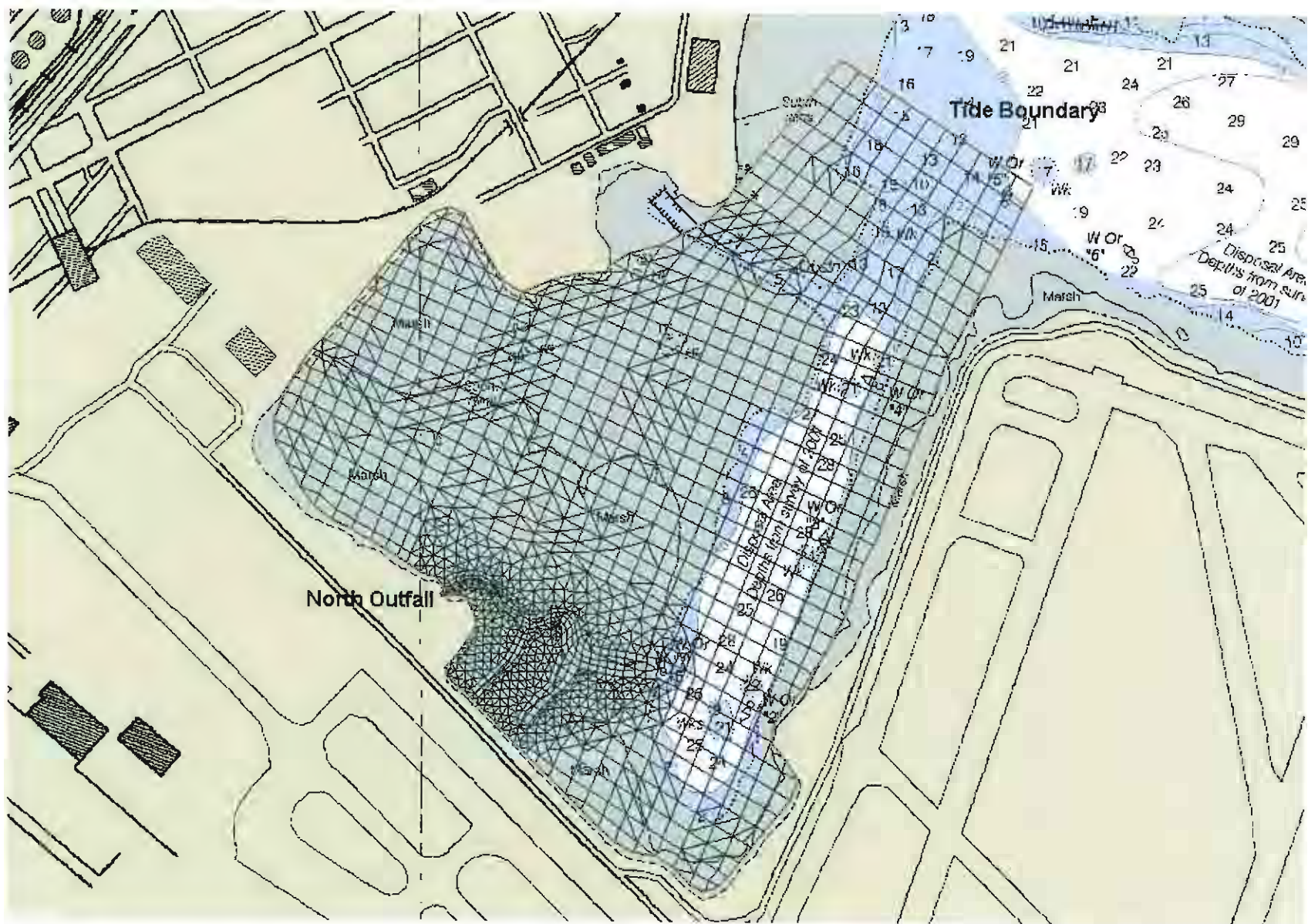


Figure 4.1-1 RMA2 Model Grid at North Outfall

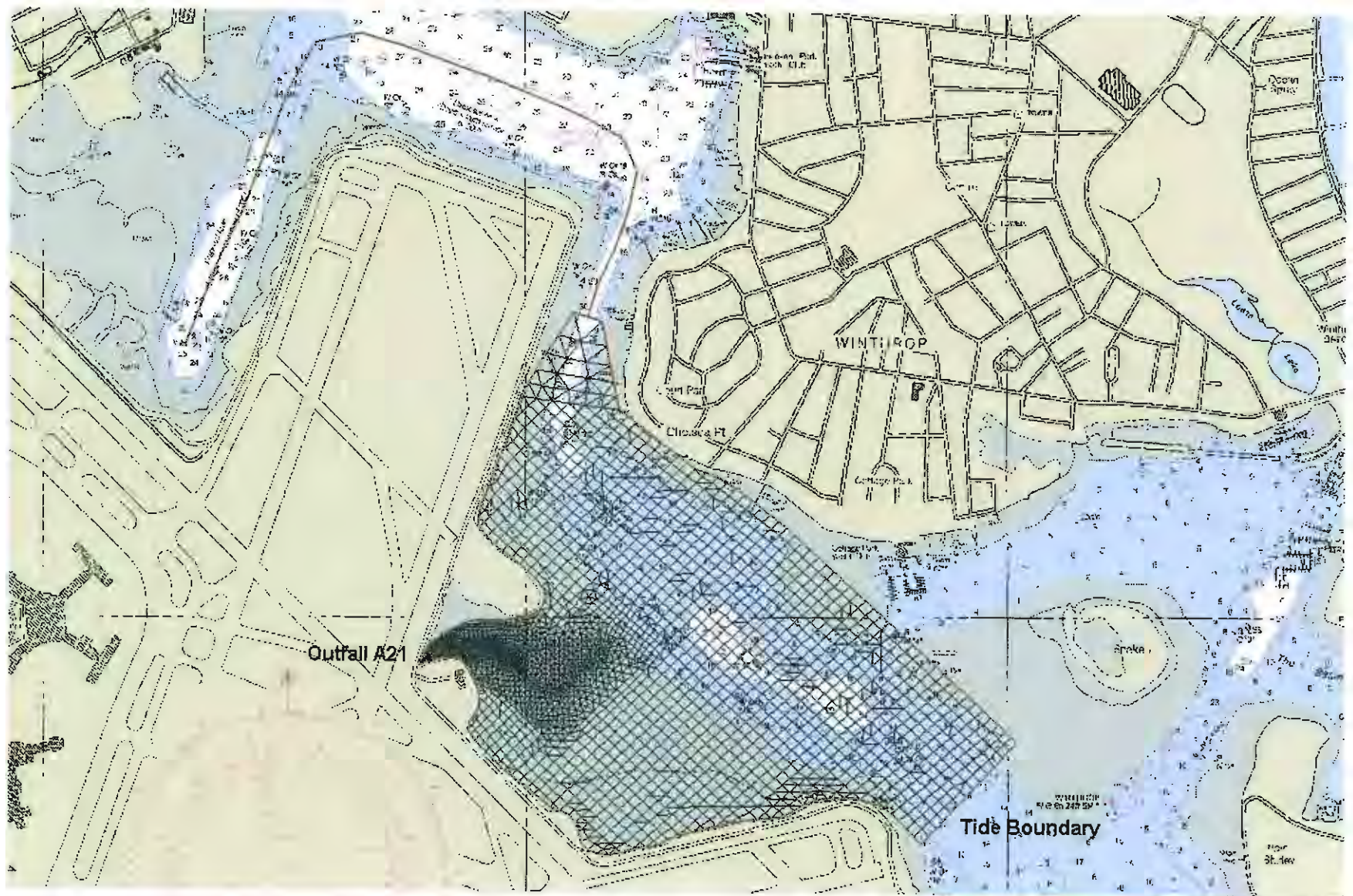


Figure 4.1-2 RMA2 Model Grid at Outfall A21

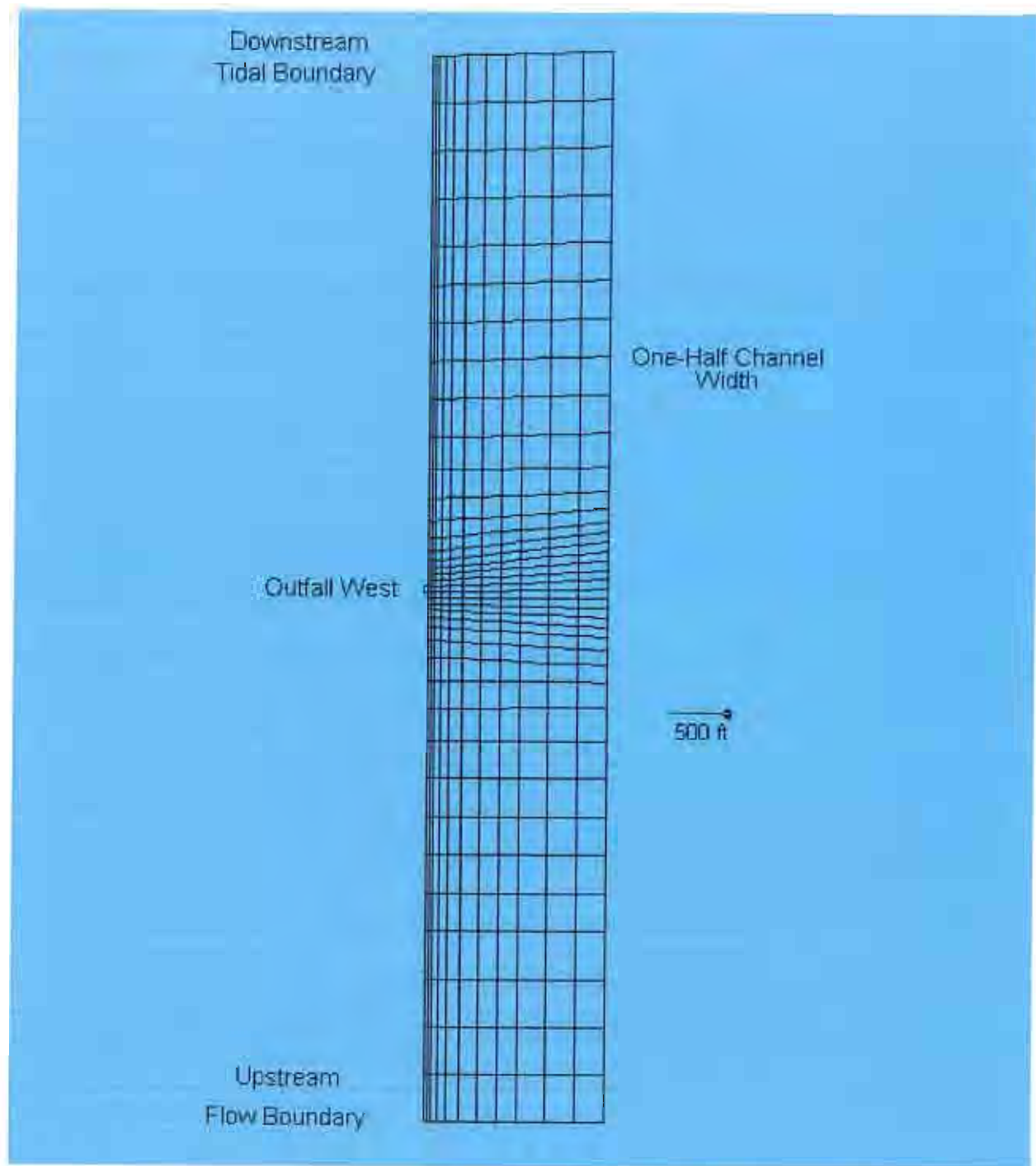


Figure 4.1-3 EFDC Model Grid for West Outfall

**Figure 4.2-1 Plume Area and Discharge Flow at Outfall North,
11-13 January 2009**

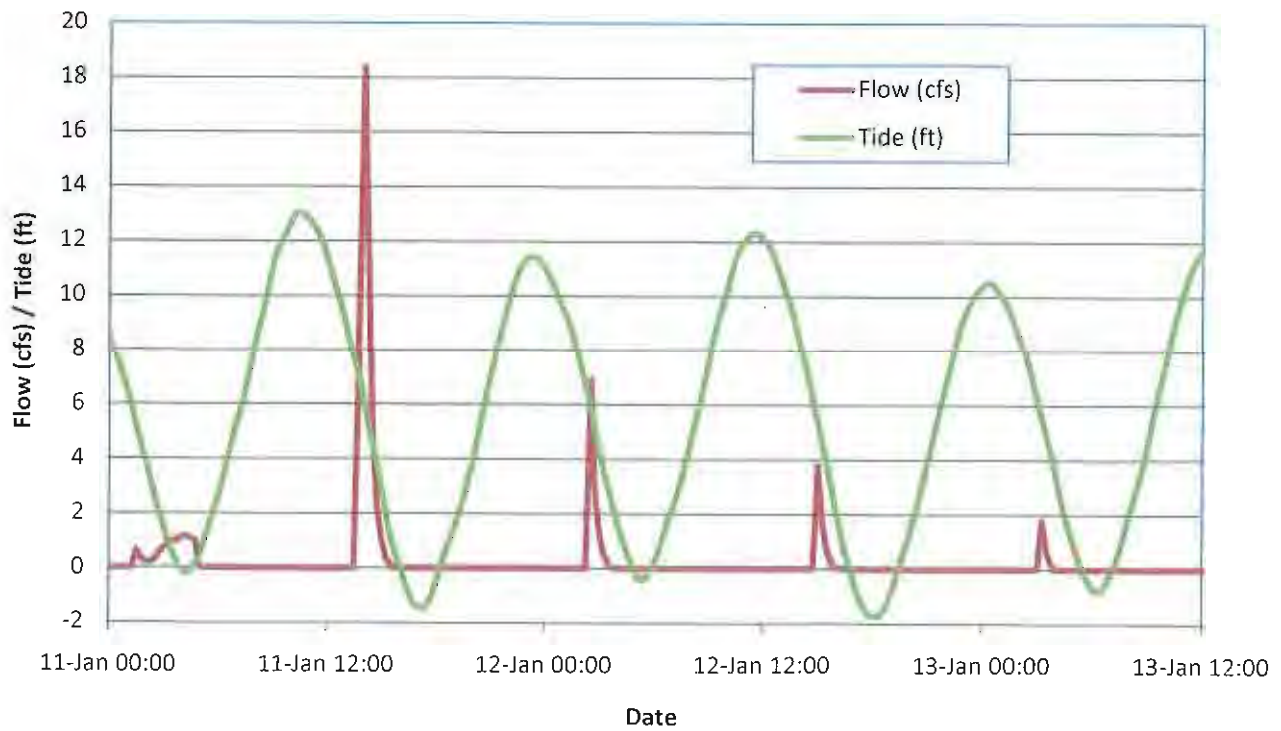
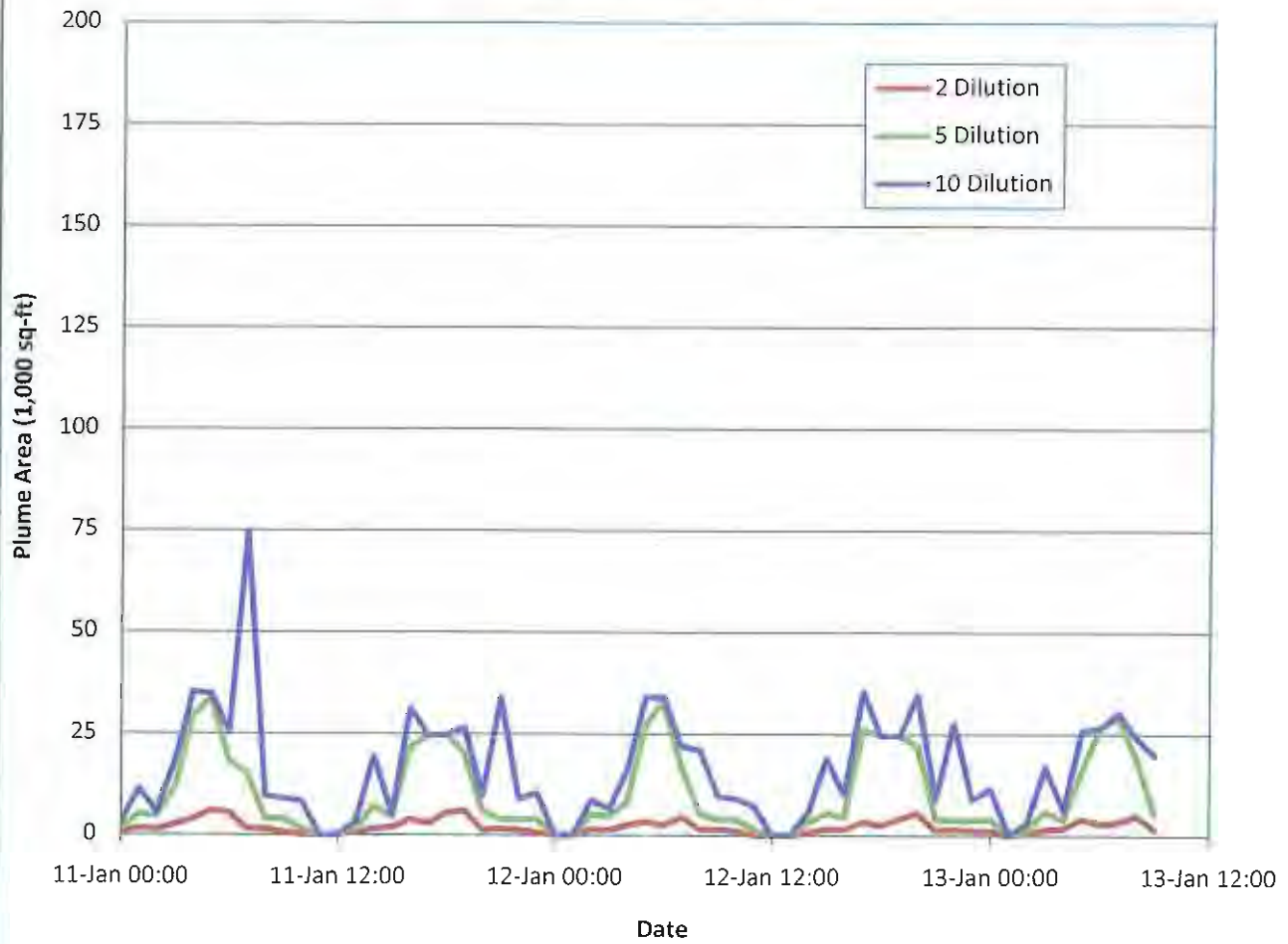
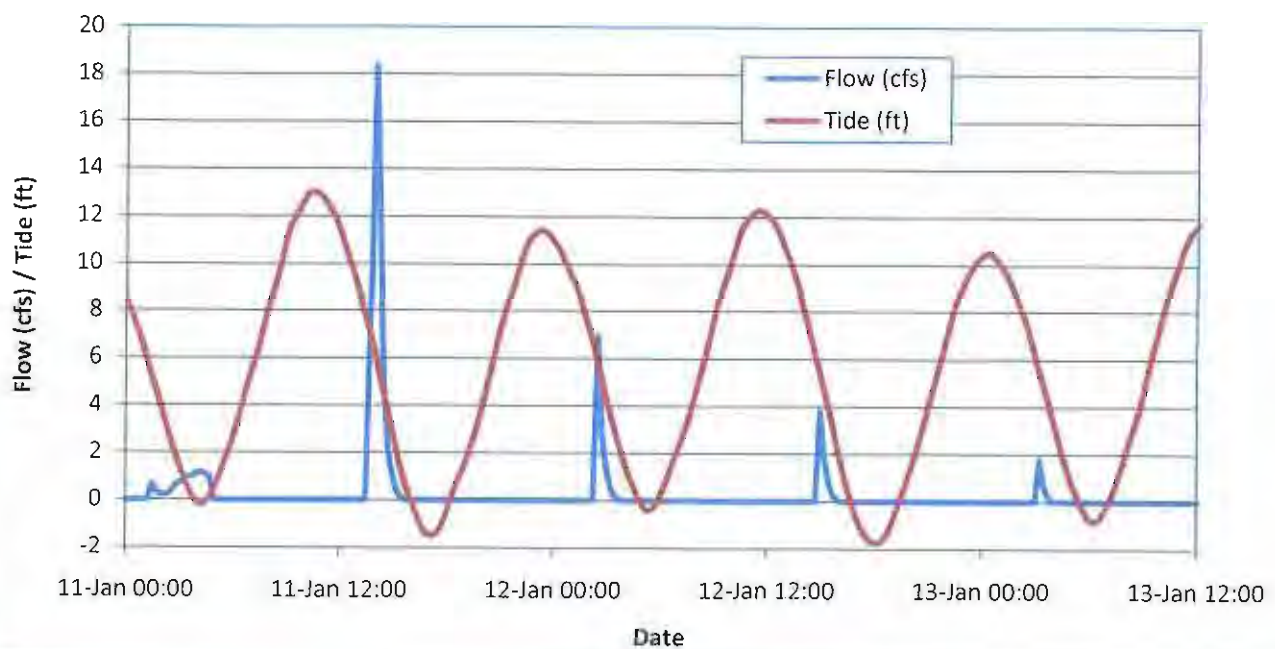
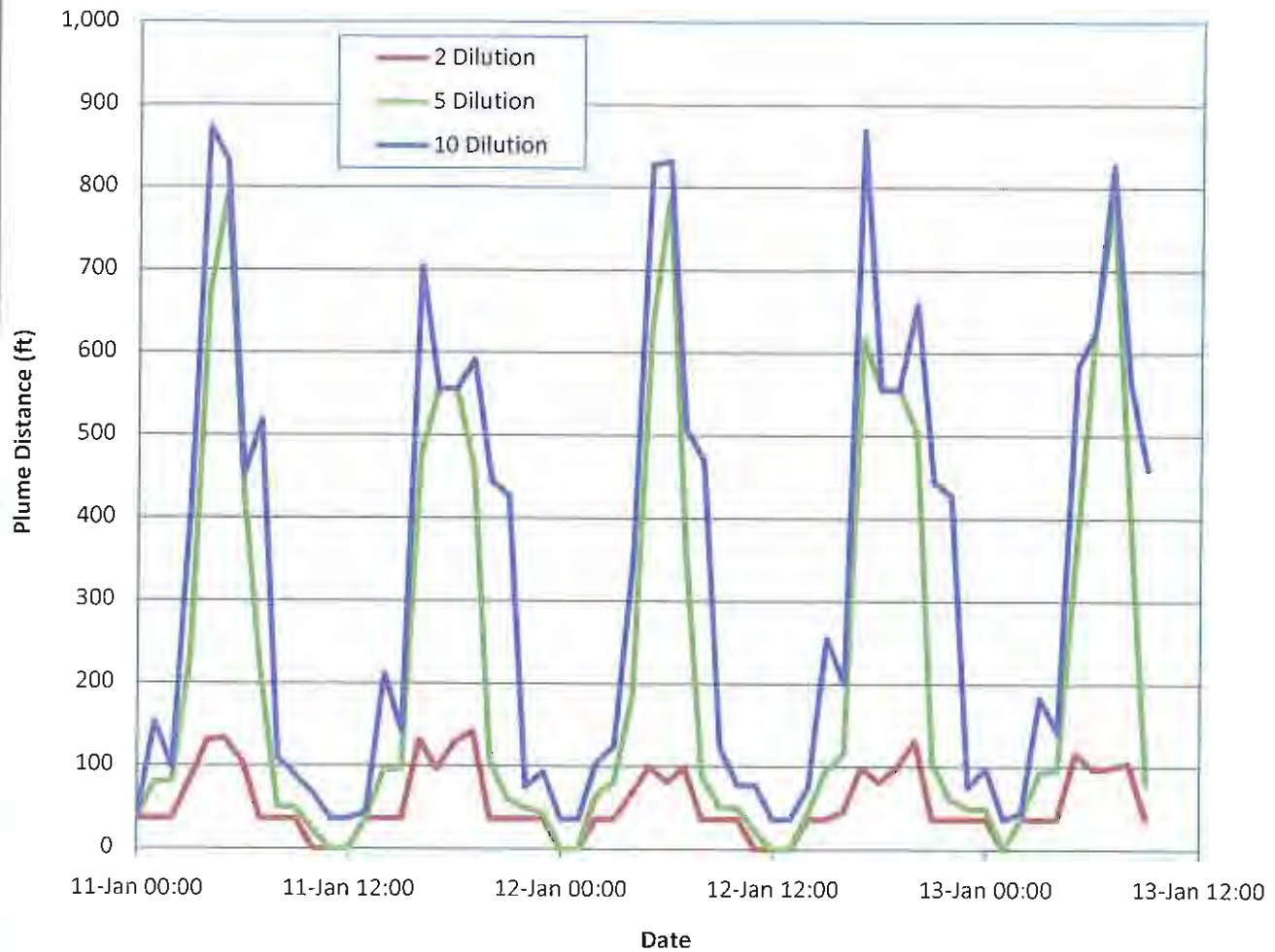


Figure 4.2-2 Plume Distance and Discharge Flow at Outfall North, 11-13 January 2009



**Figure 4.2-3 Plume Area and Discharge Flow at Outfall North,
28-30 January 2009**

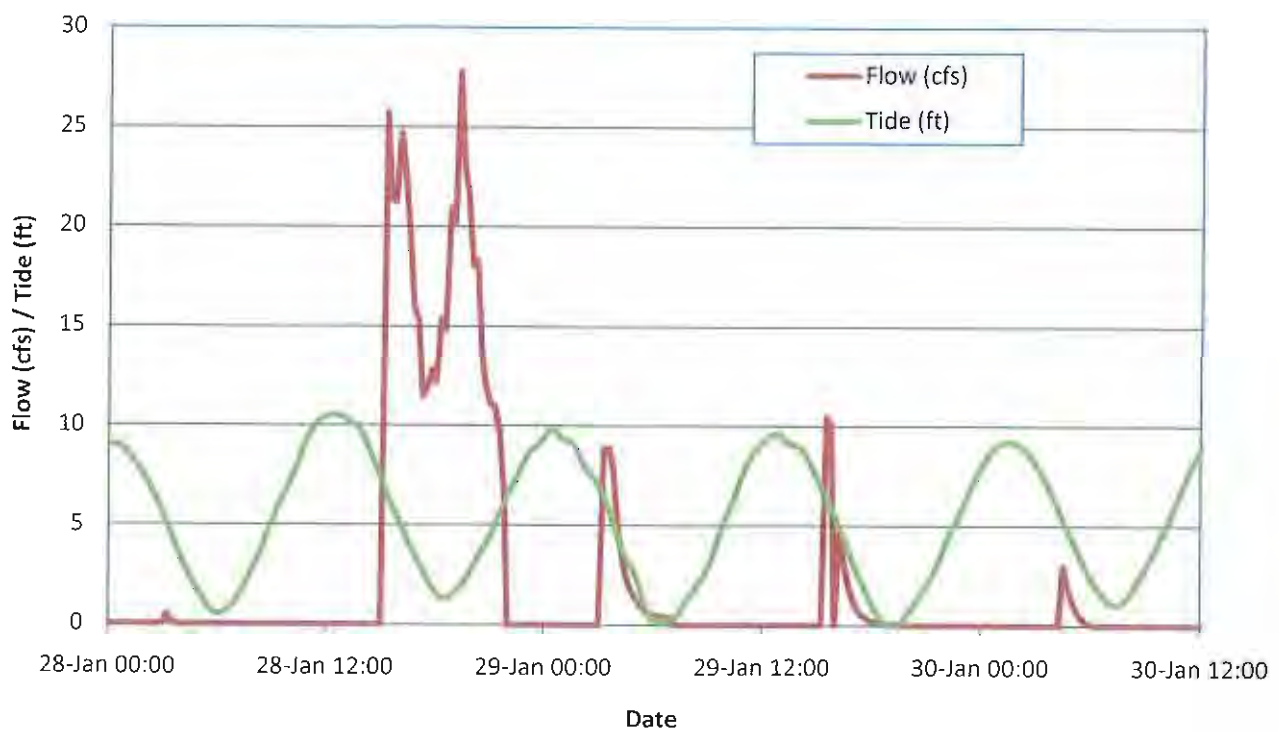
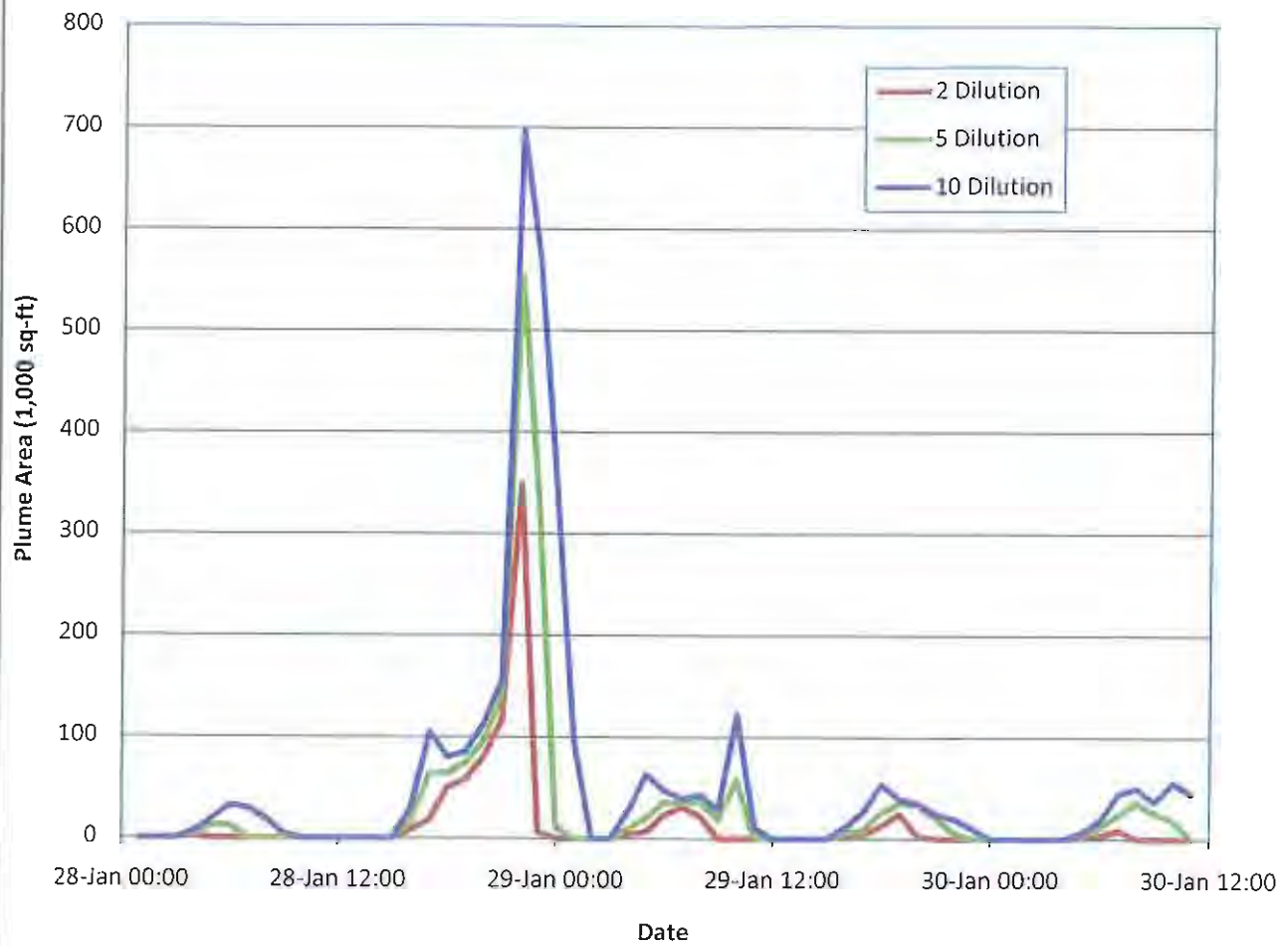
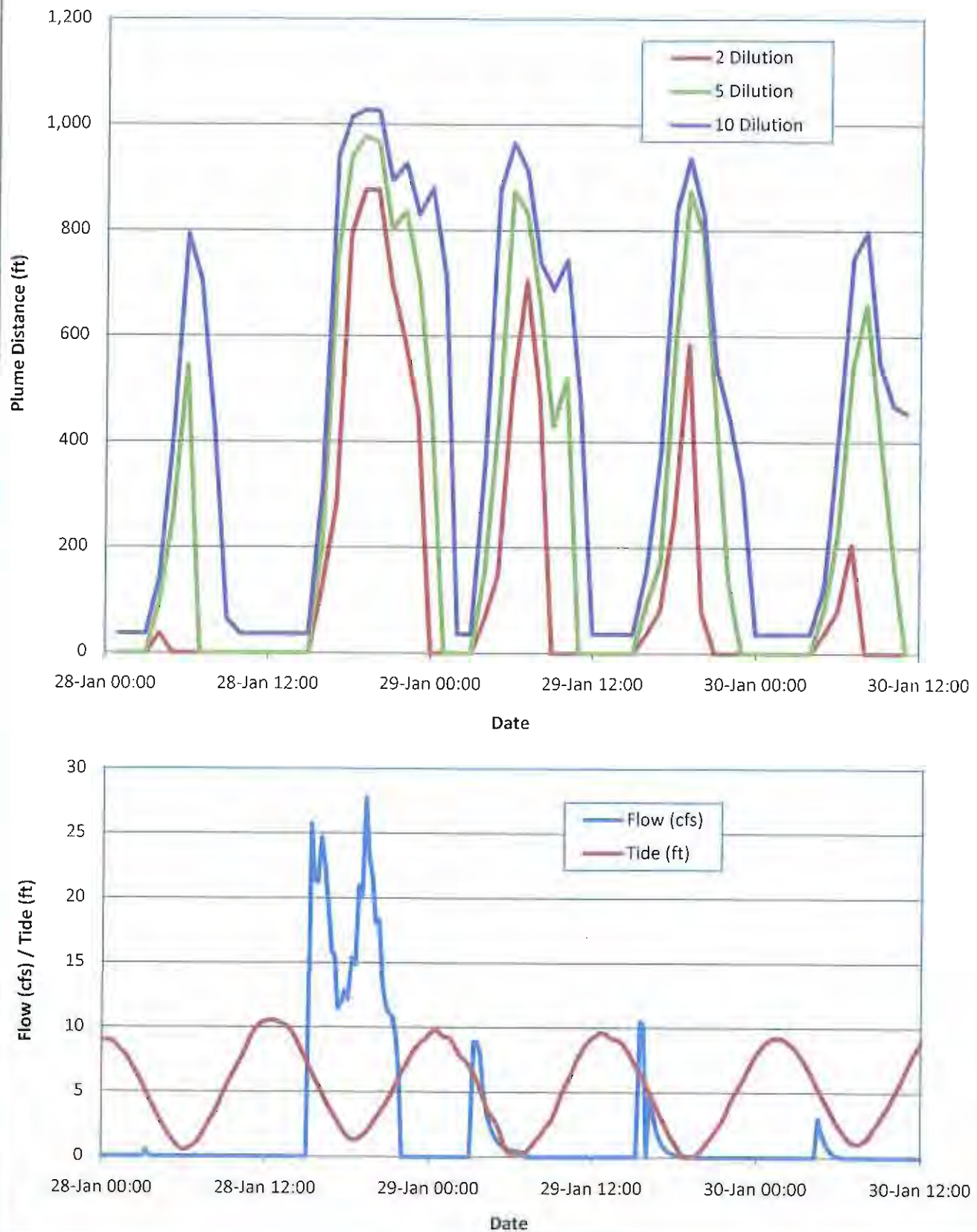
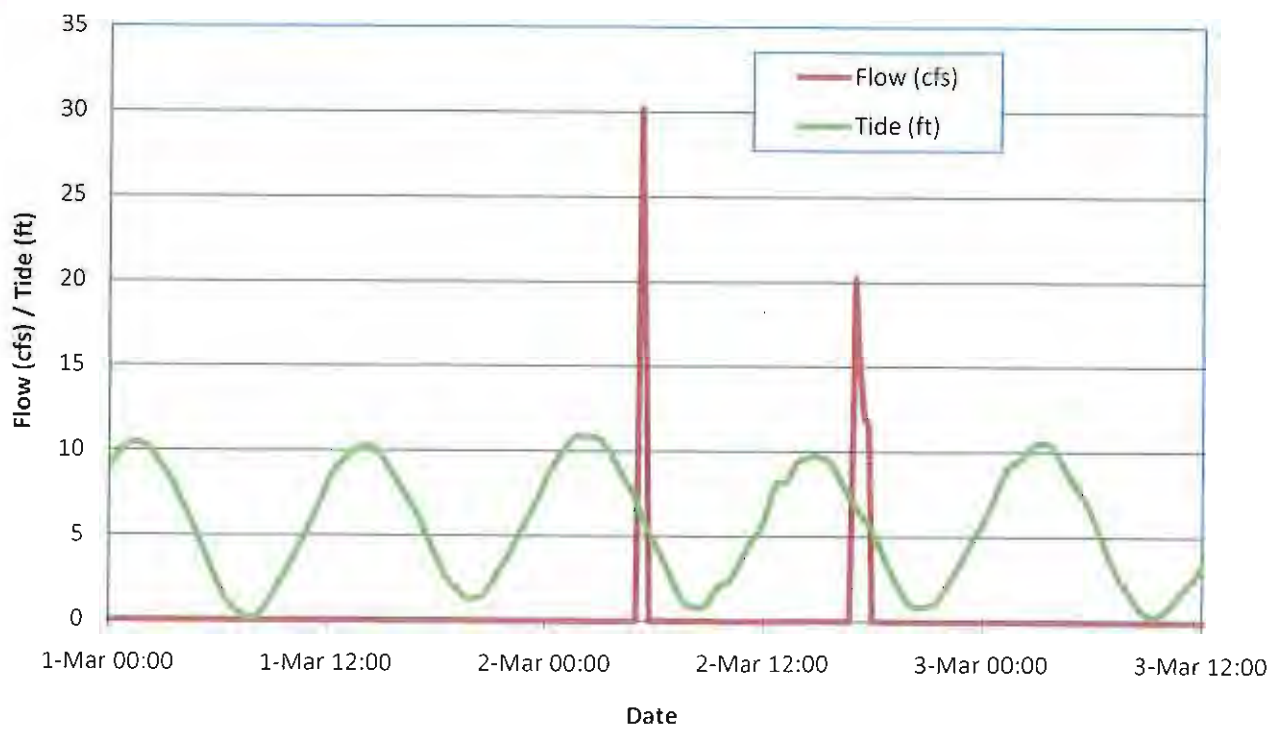
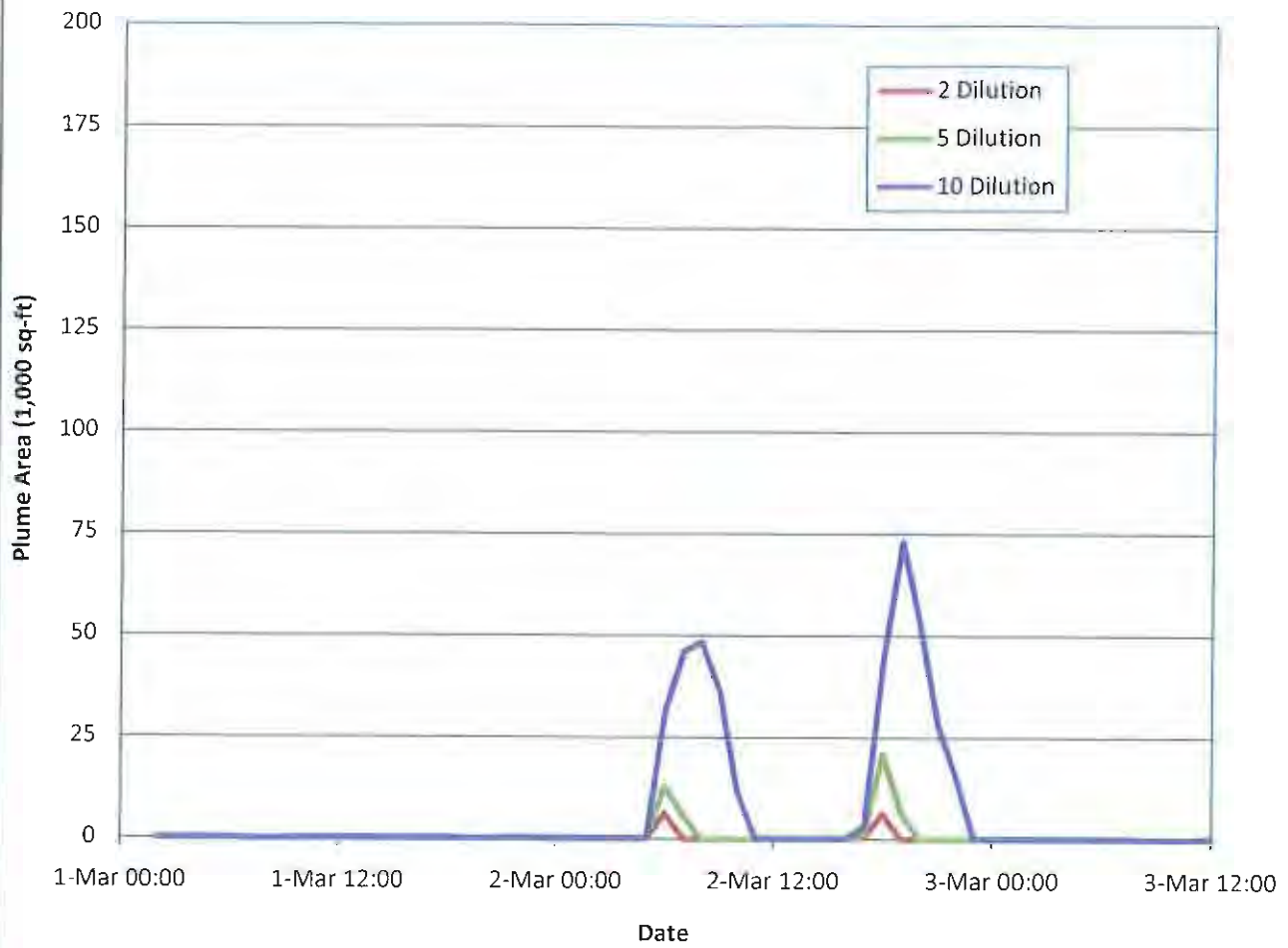


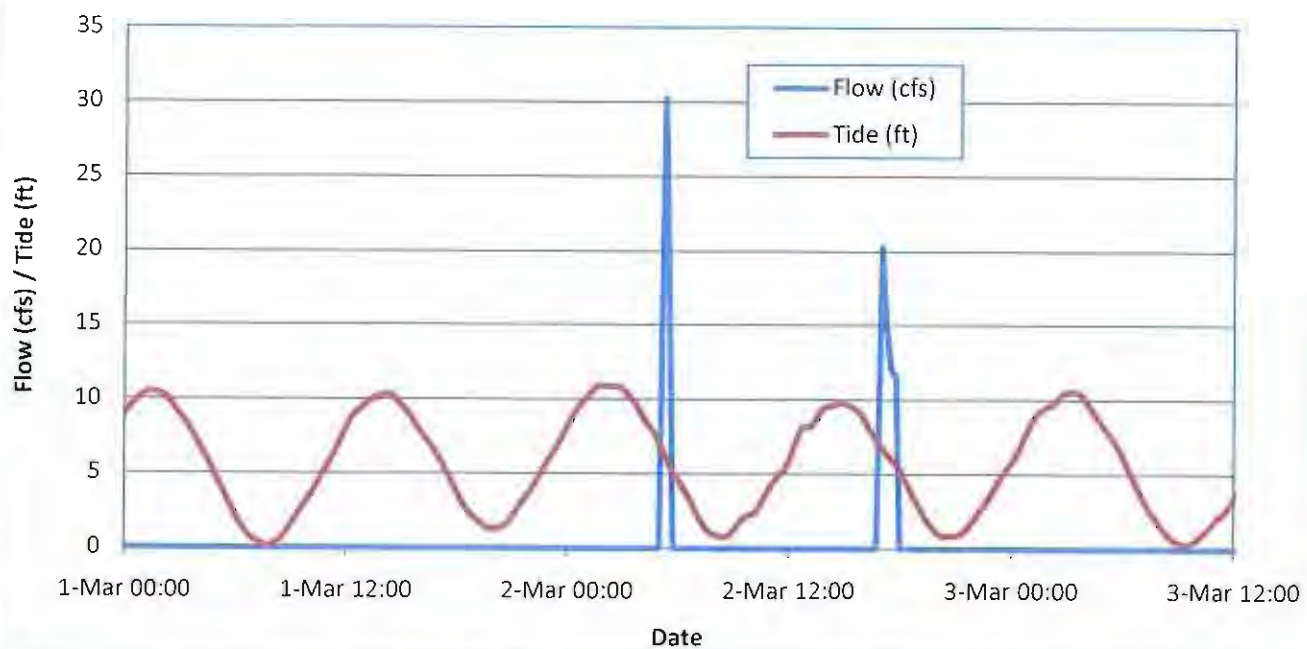
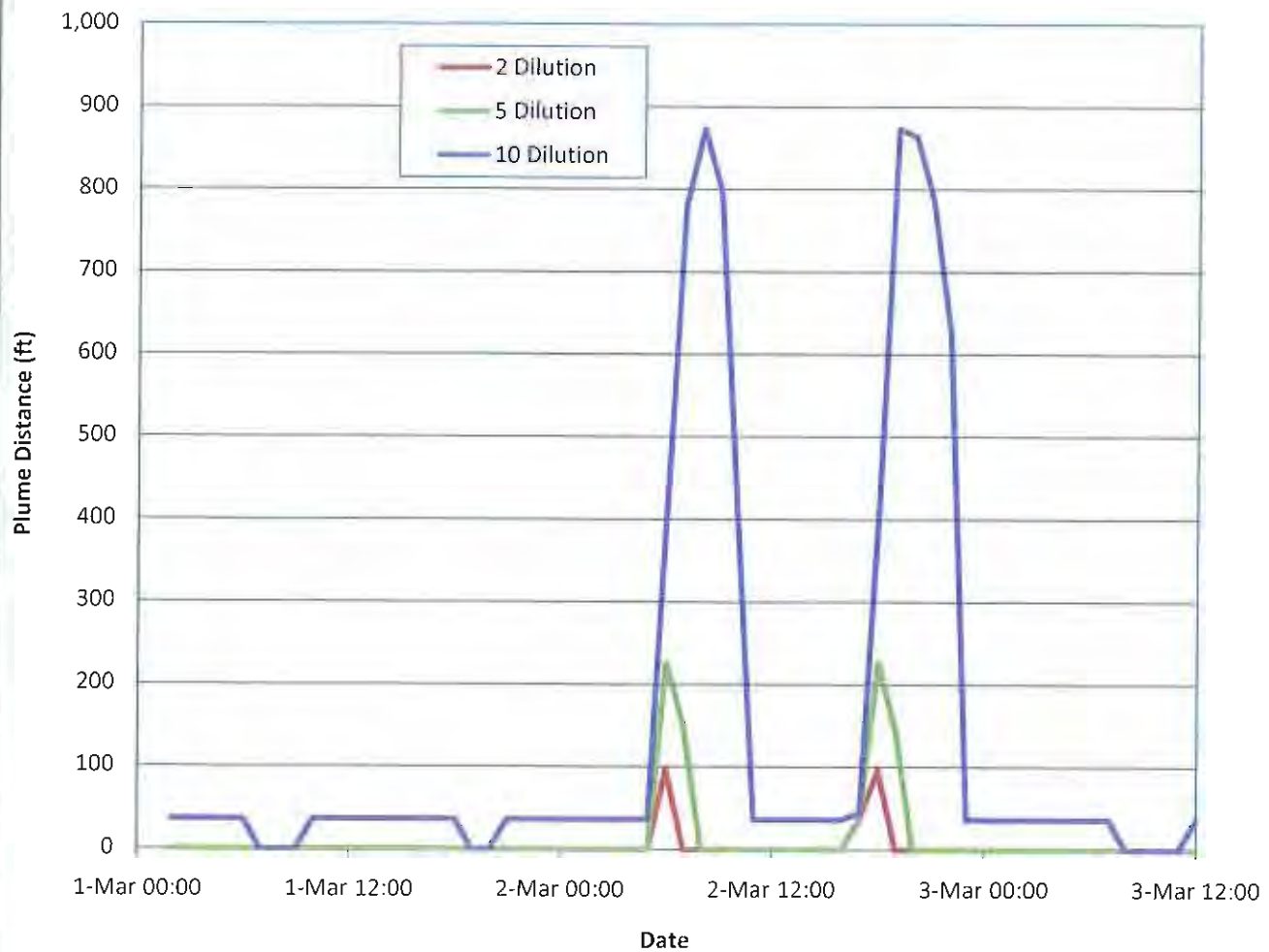
Figure 4.2-4 Plume Distance and Discharge Flow at Outfall North, 28-30 January 2009



**Figure 4.2.5 Plume Area and Discharge Flow at Outfall North,
1-3 March 2009**



**Figure 4.2-6 Plume Distance and Discharge Flow at Outfall North,
1-3 March 2009**



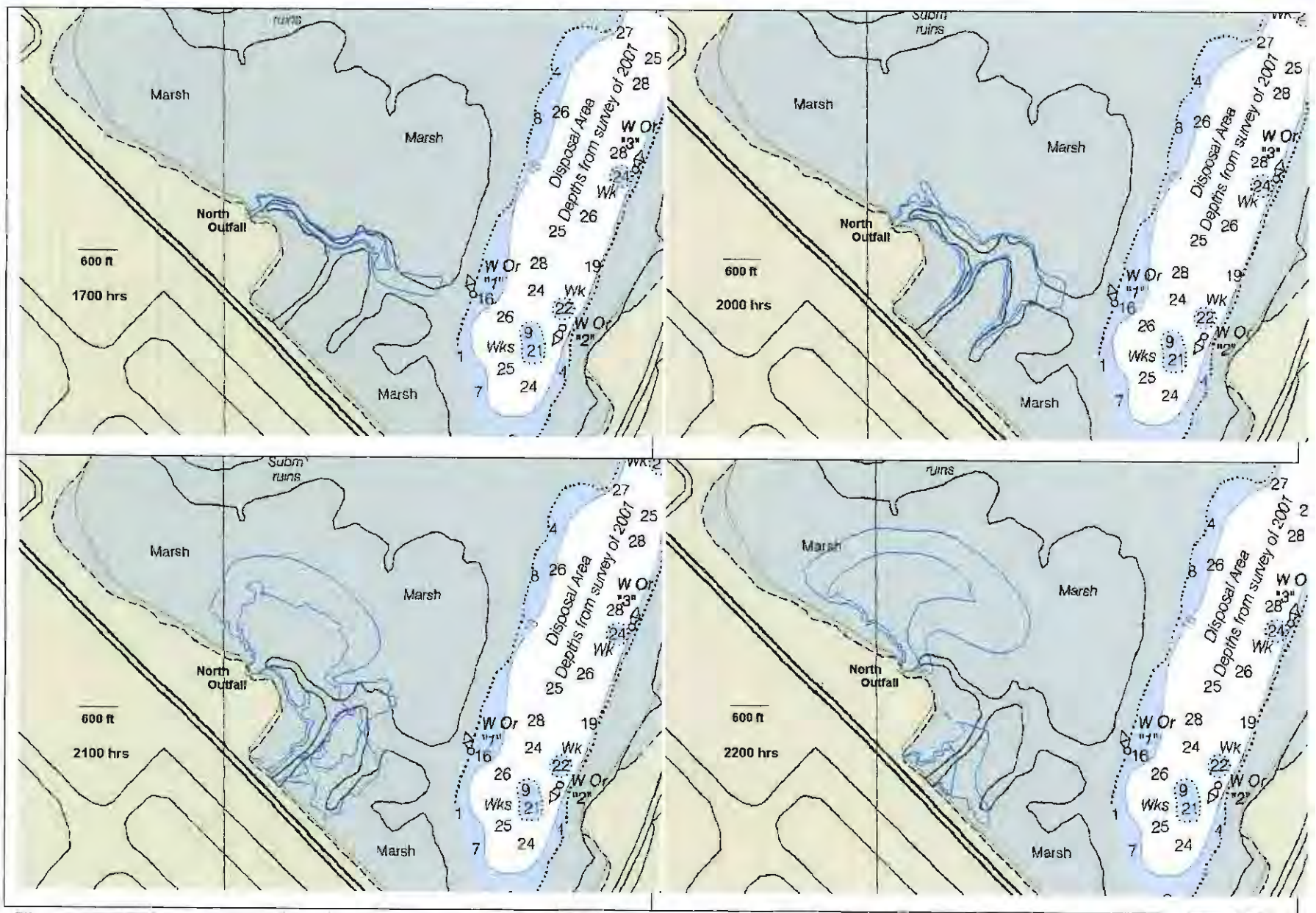
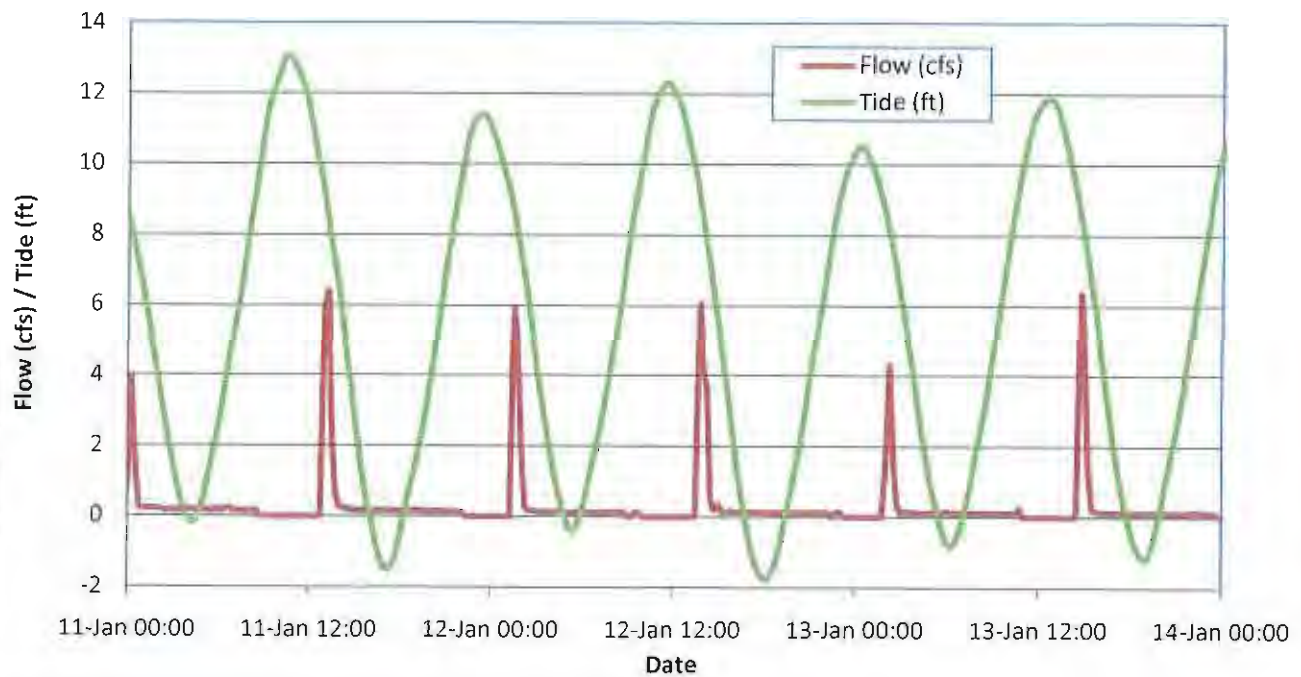
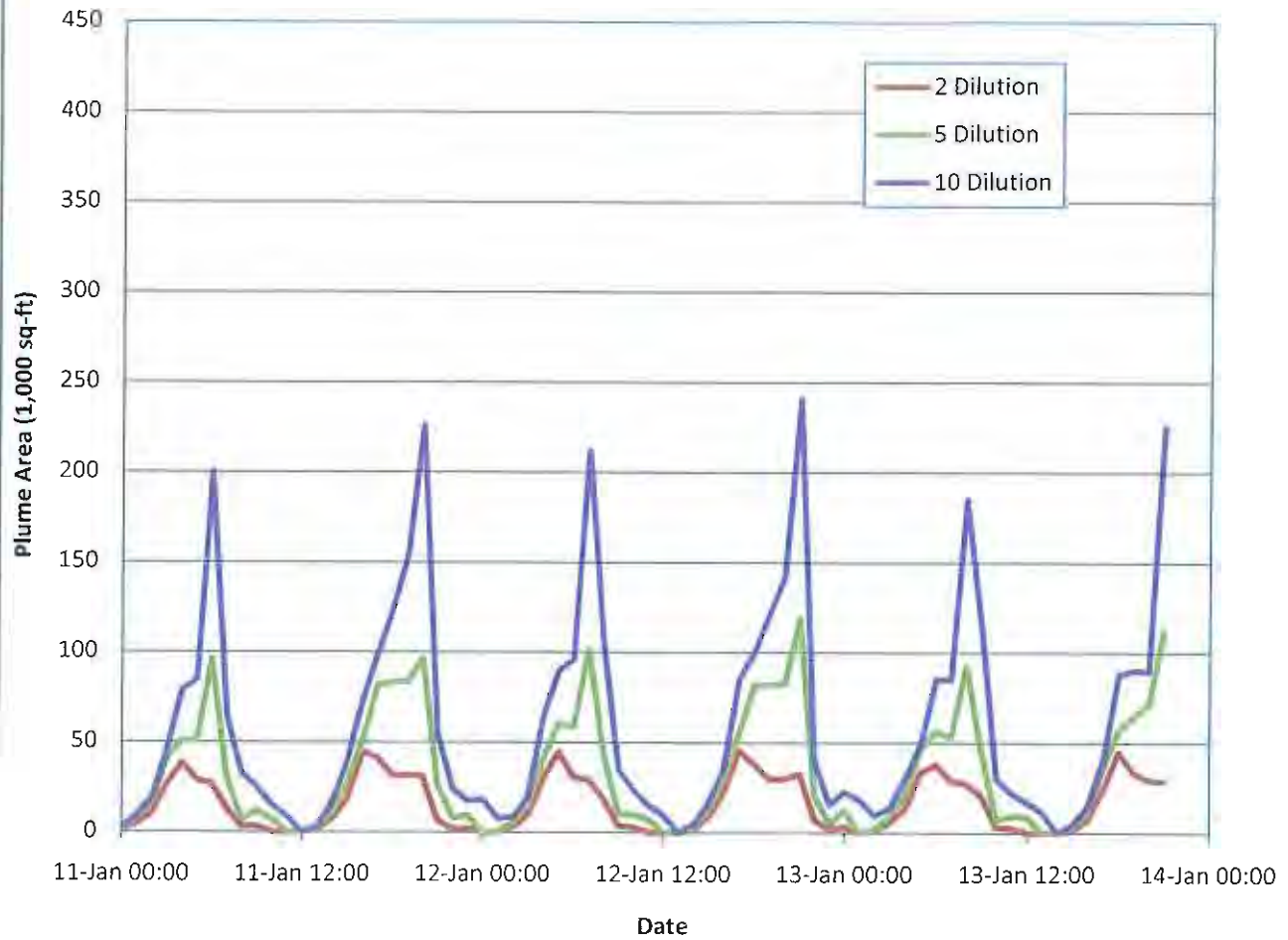
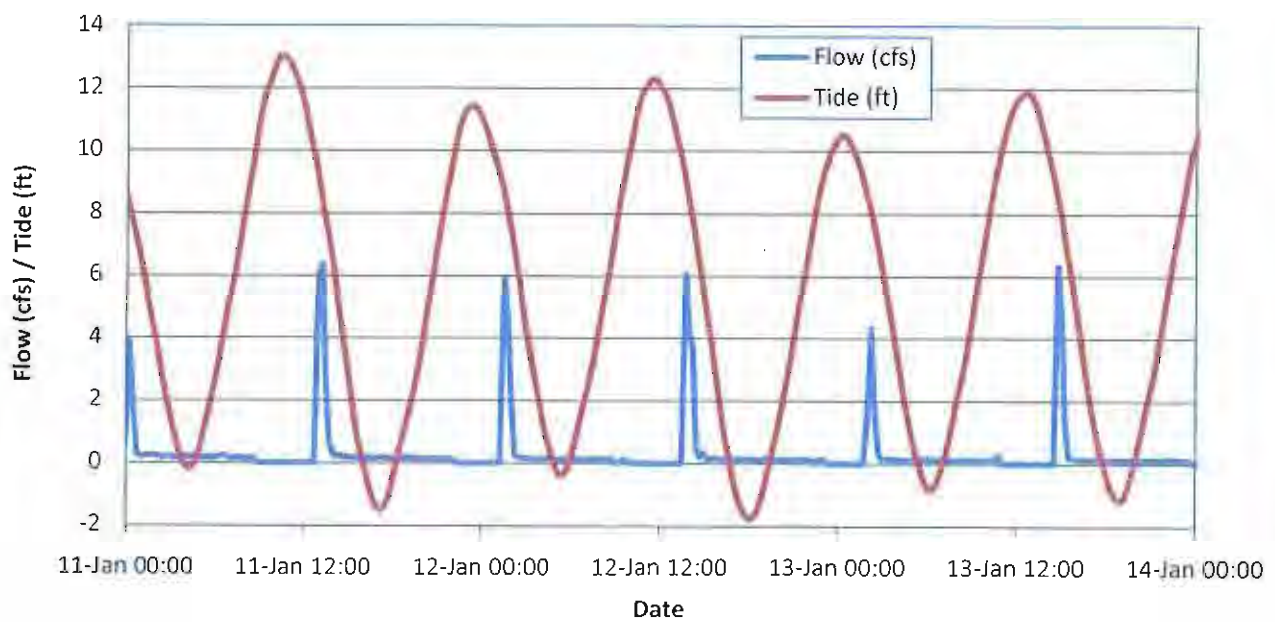
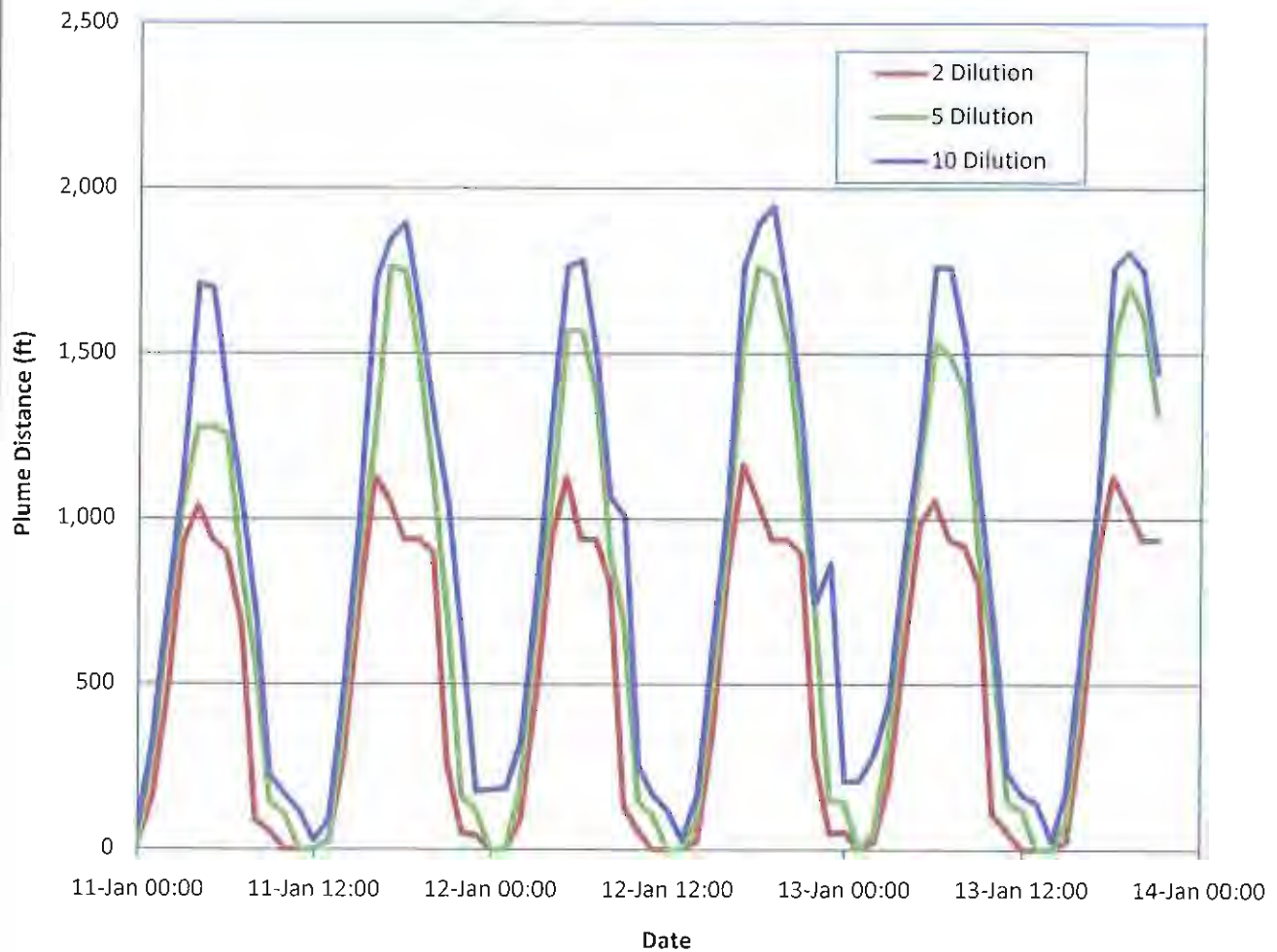


Figure 4.2-7 Factor of 2 and 5 Dilution Contours at North Outfall, 28 January 2009

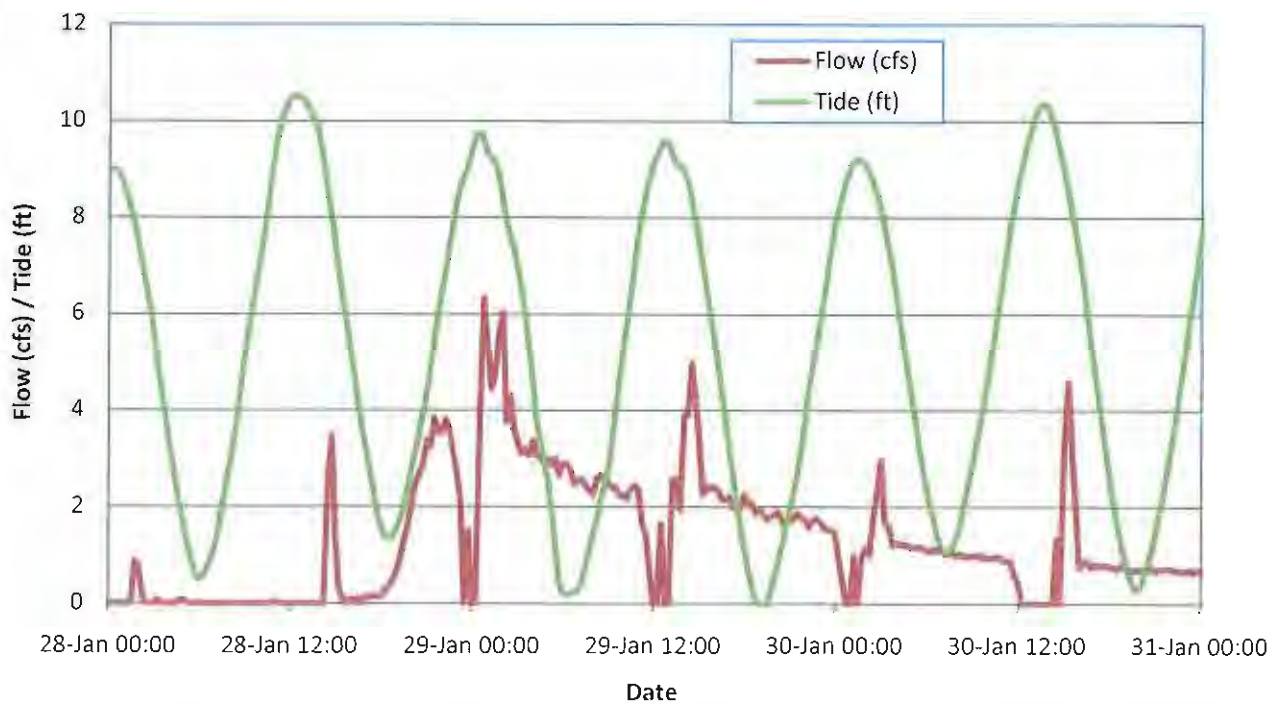
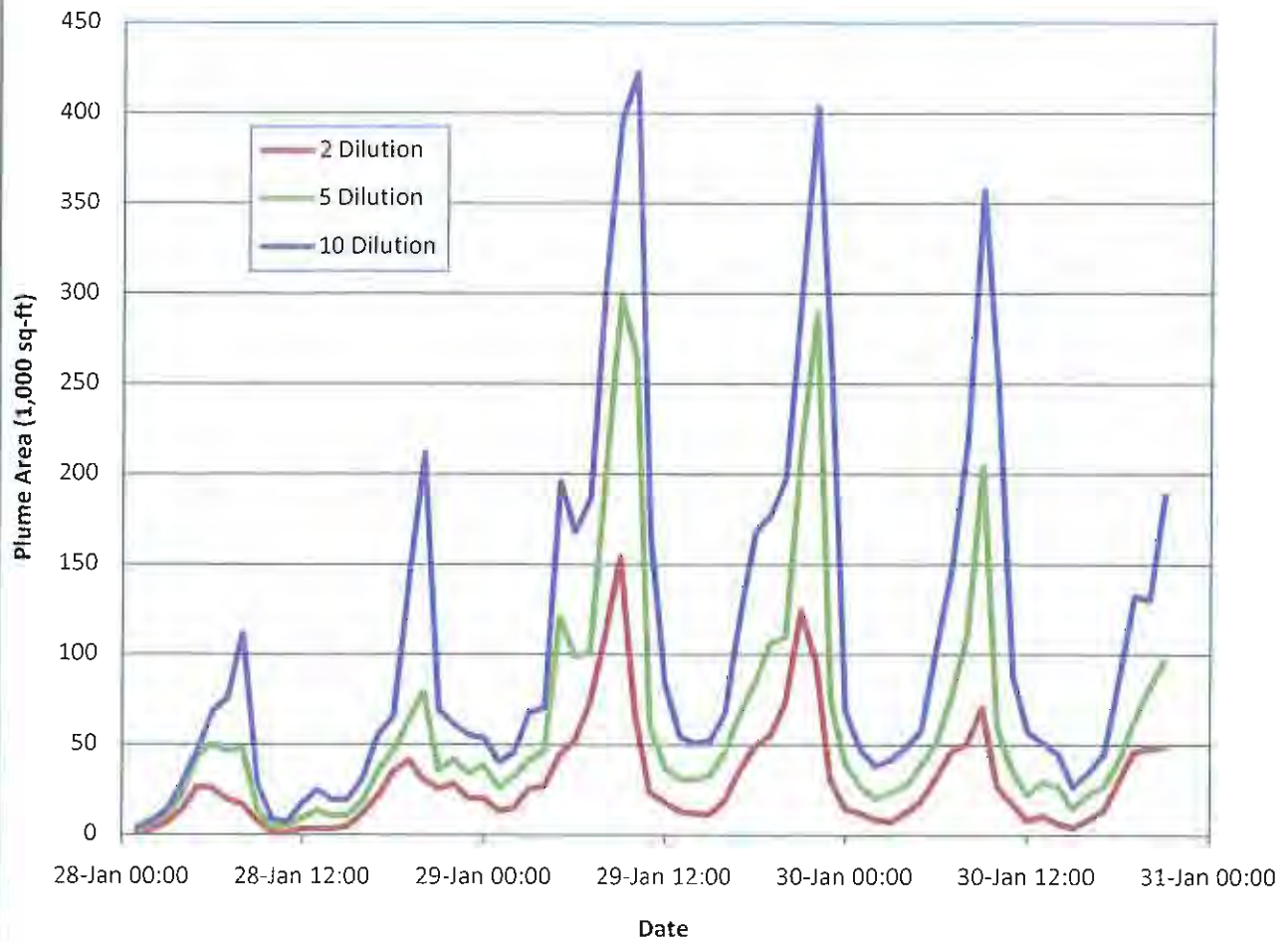
**Figure 4.2-8 Plume Area and Discharge Flow at Outfall A21,
11-13 January 2009 Event**



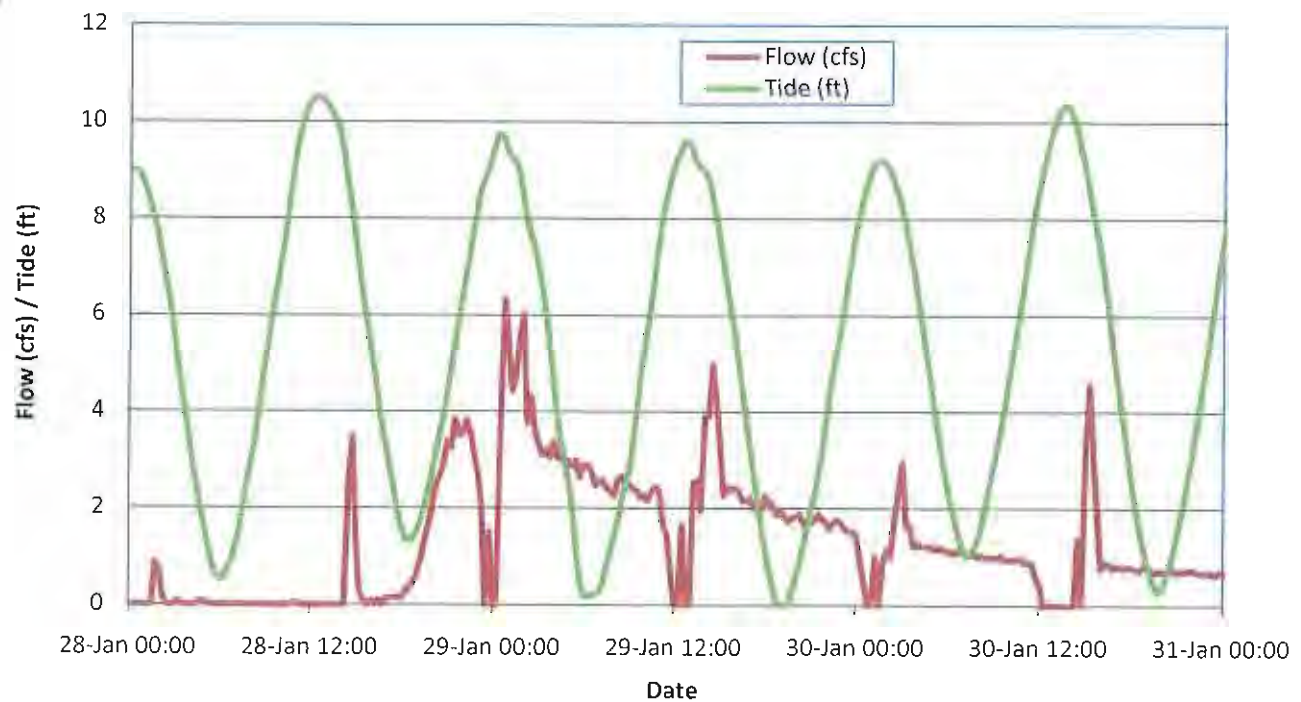
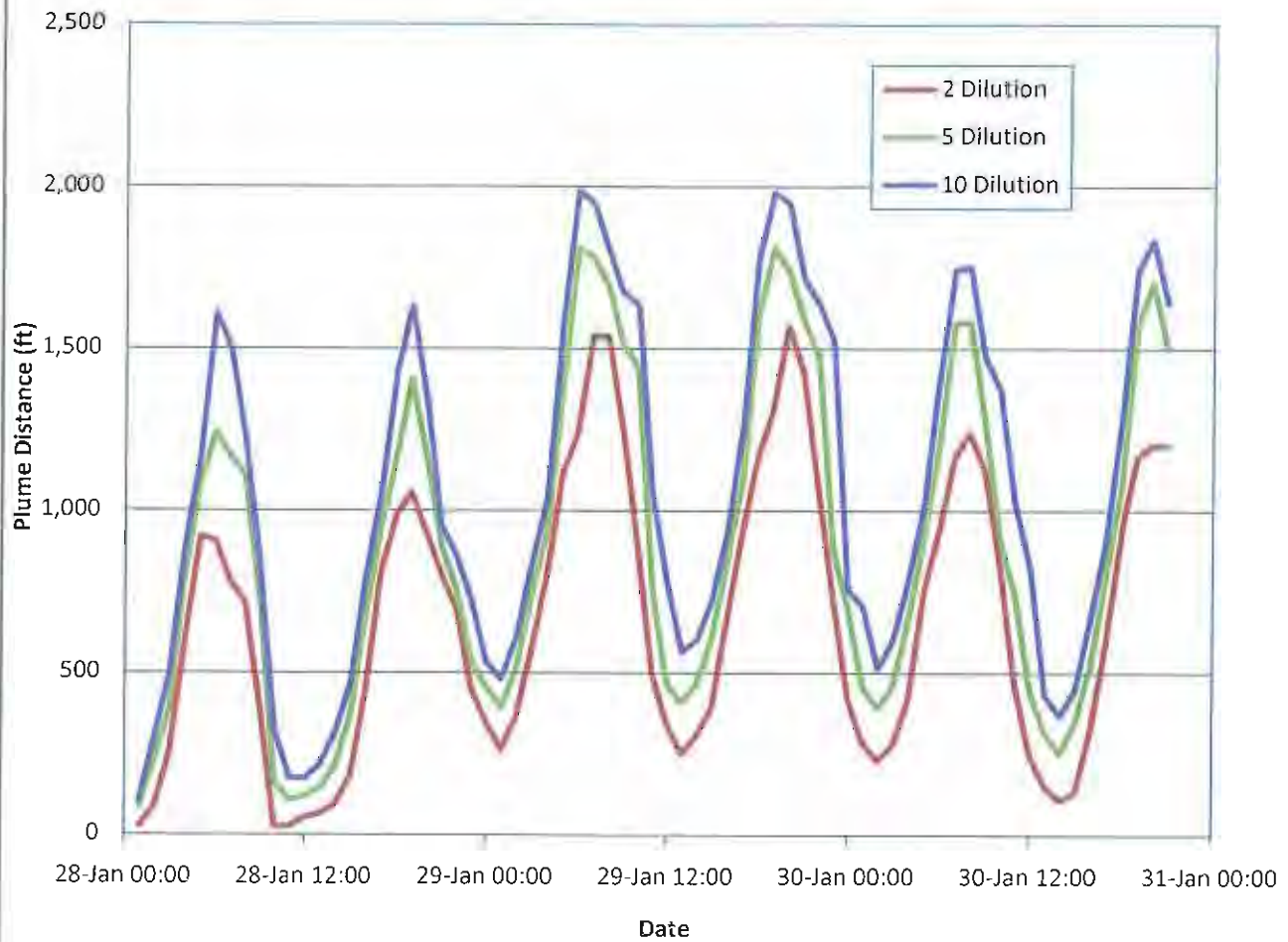
**Figure 4.2-9 Plume Distance and Discharge Flow at Outfall A21,
11-13 January 2009 Event**



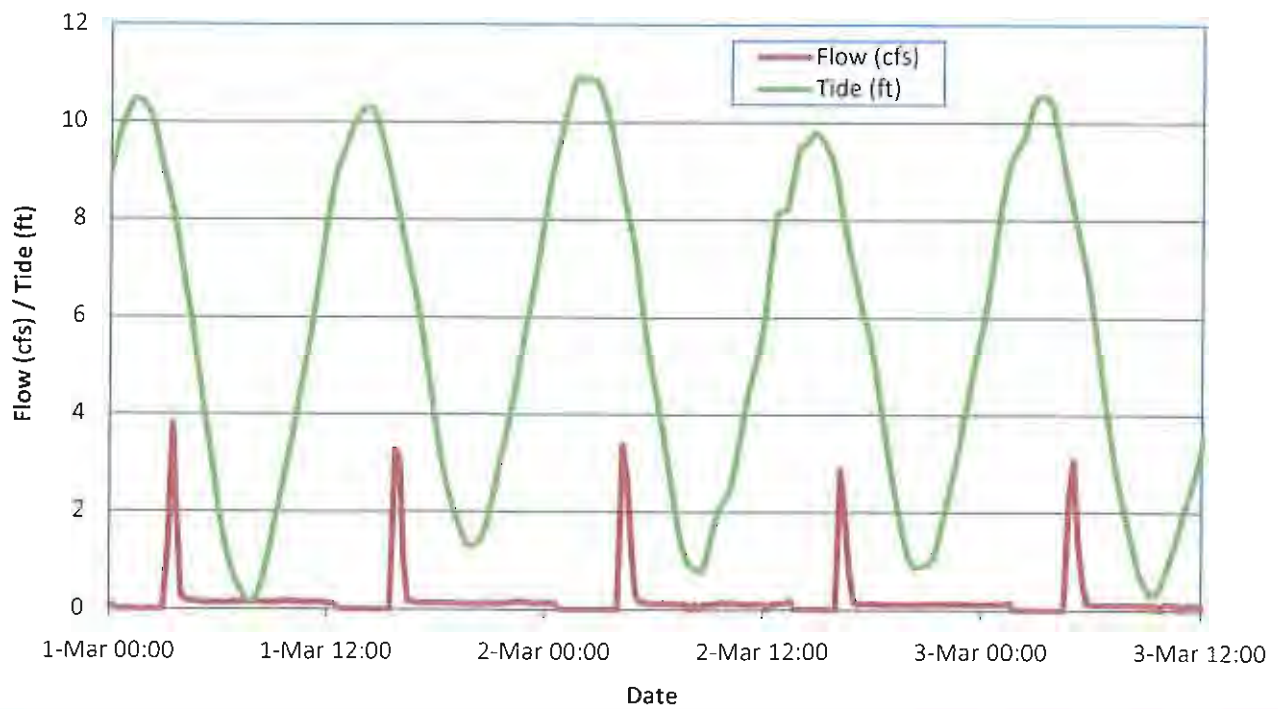
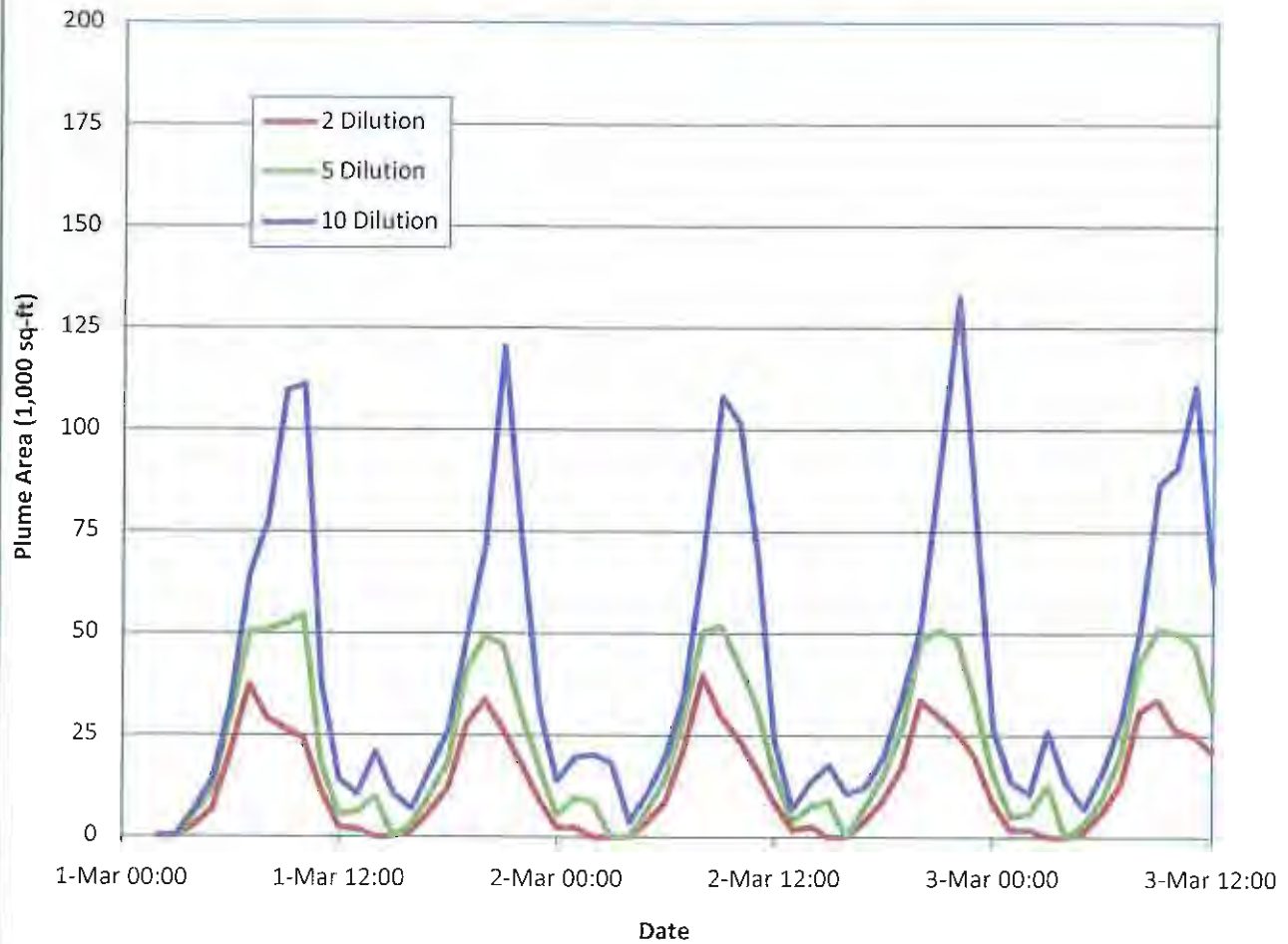
**Figure 4.2-10 Plume Area and Discharge Flow at Outfall A21,
28-30 January 2009 Event**



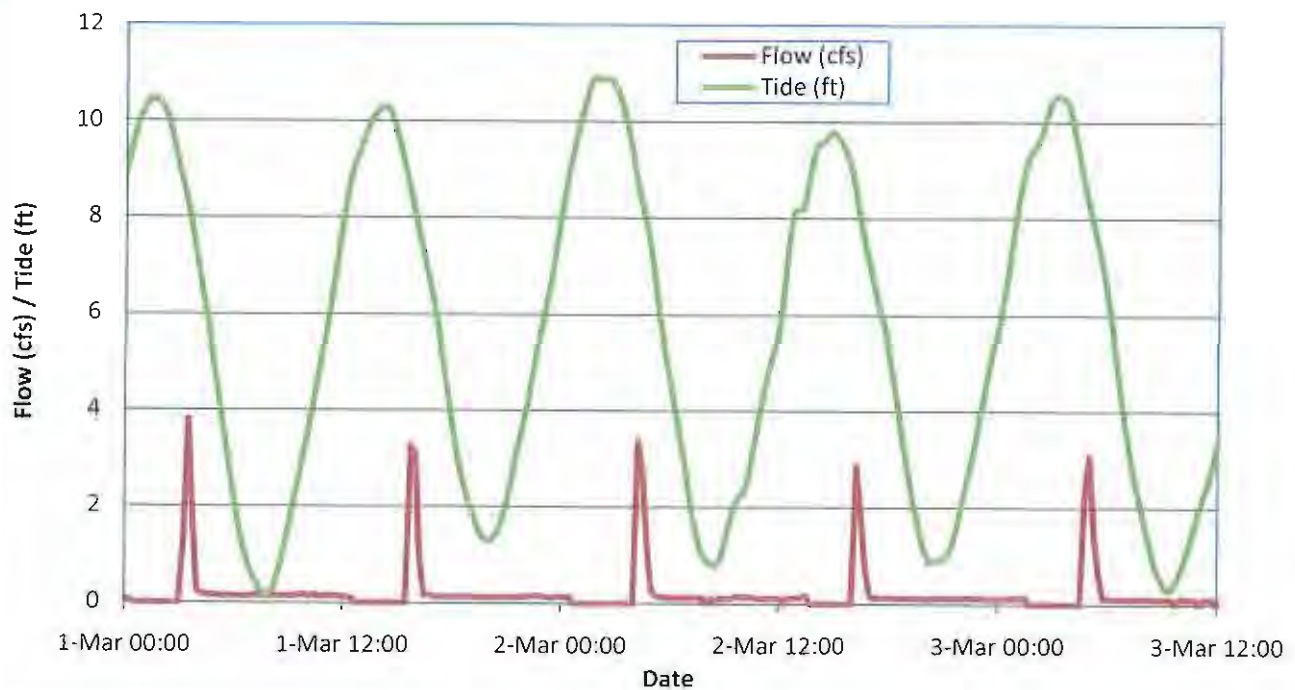
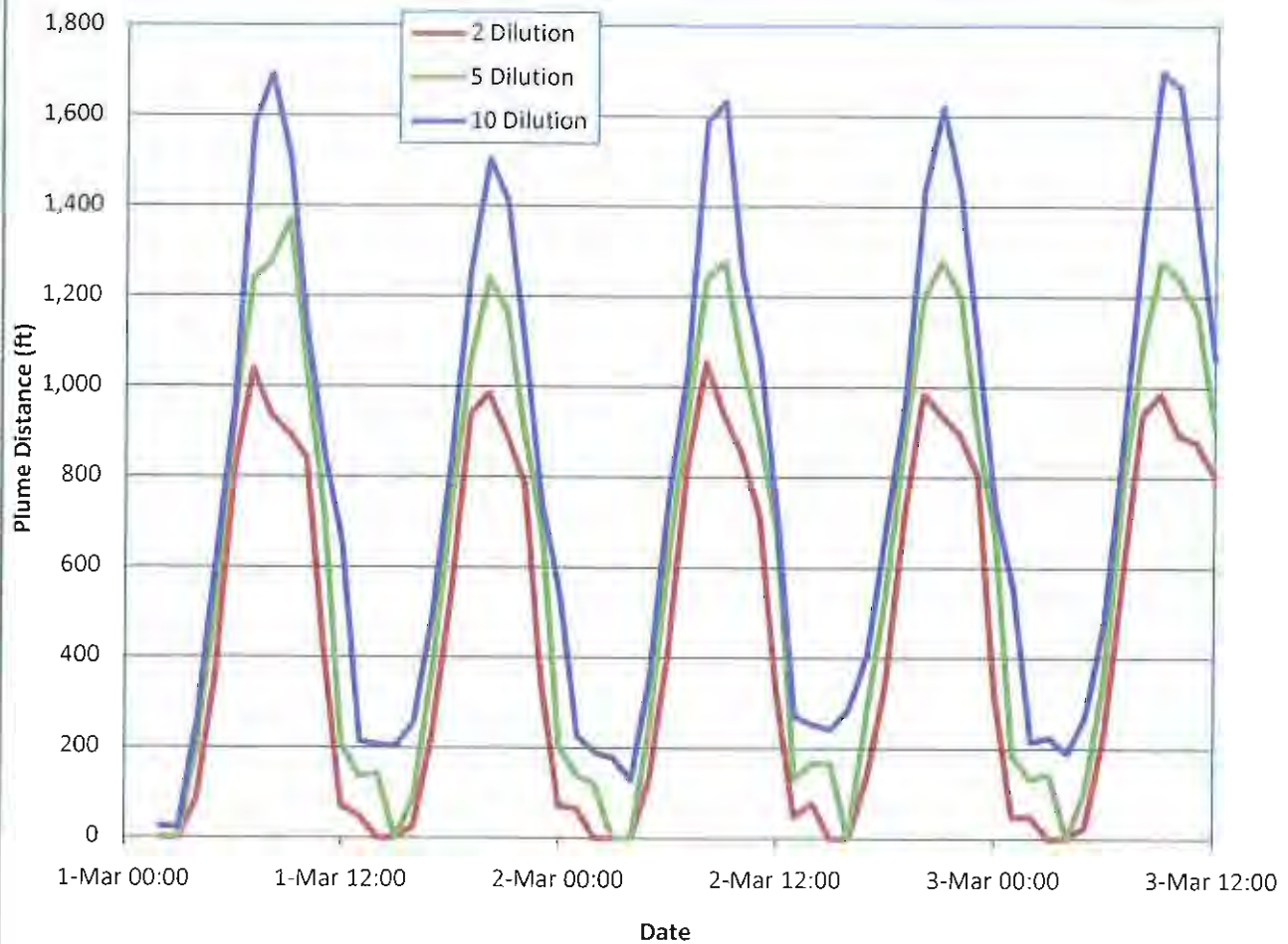
**Figure 4.2-11 Plume Distance and Discharge Flow at Outfall A21,
28-30 January 2009 Event**



**Figure 4.2-12 Plume Area and Discharge Flow at Outfall A21,
1-3 March 2009 Event**



**Figure 4.2-13 Plume Distance and Discharge Flow at Outfall A21,
1-3 March 2009 Event**



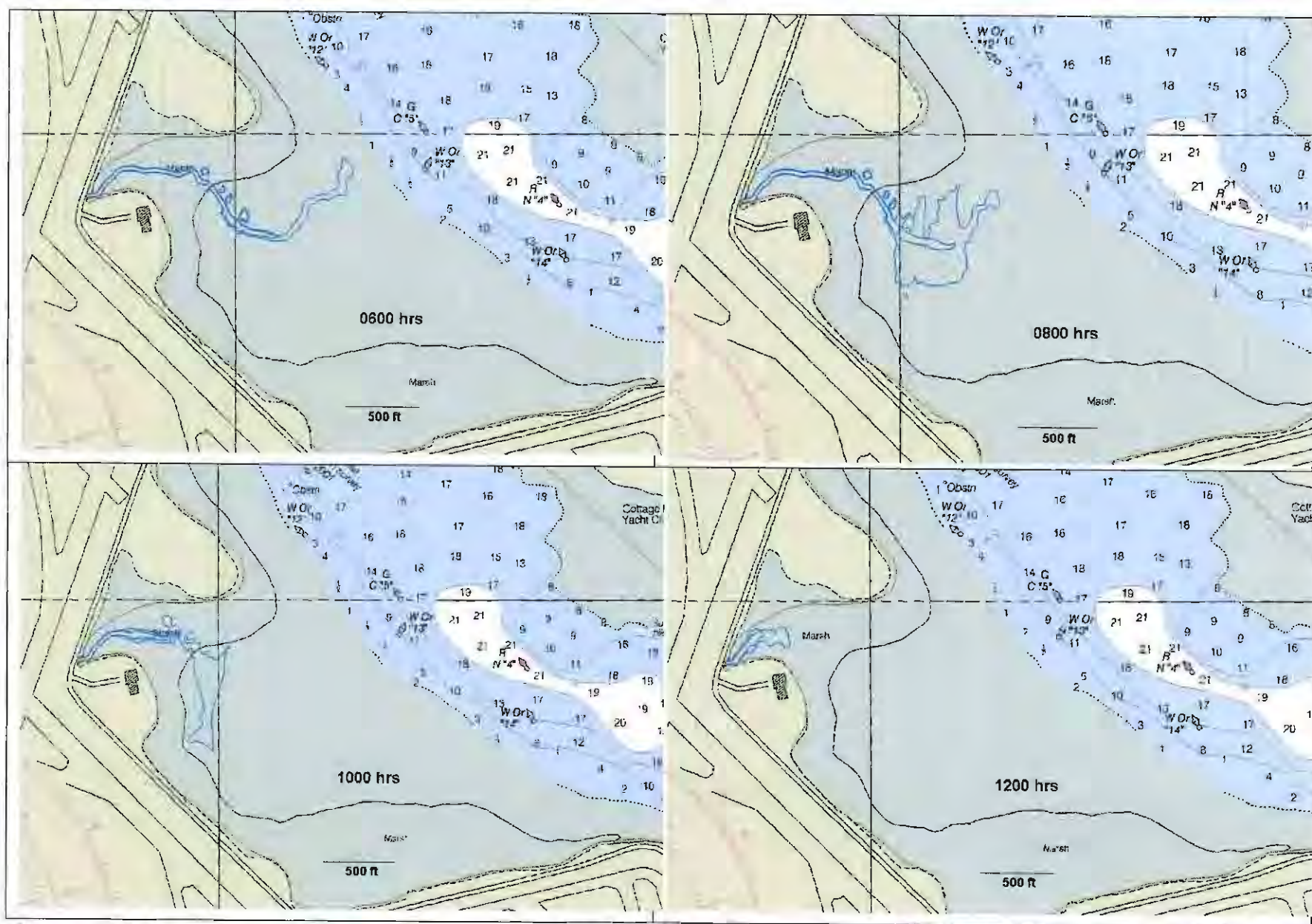


Figure 4.2-14 Factor of 2 and 5 Dilution Contours at Outfall A21, 29 January 2009

Figure 4.2-15 Plume Area and Discharge Flow at West Outfall, 19-21 December 2008 Event

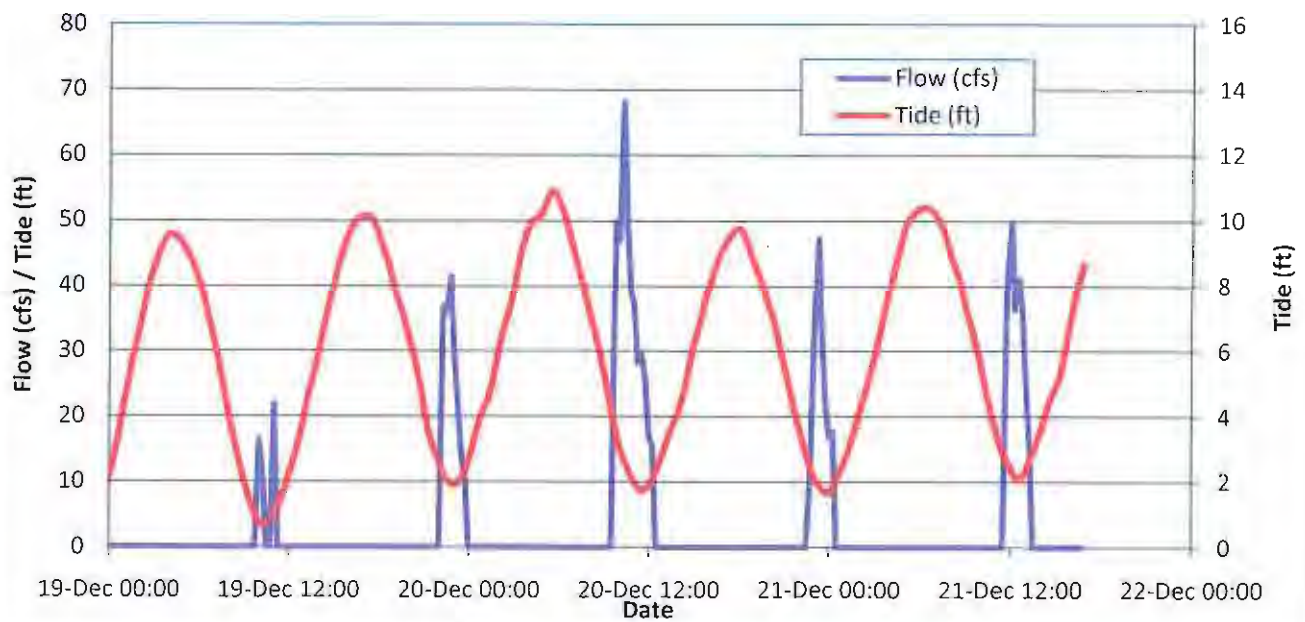


Figure 4.2-16 Plume Distance and Discharge Flow at West Outfall, 19-21 December 2008 Event

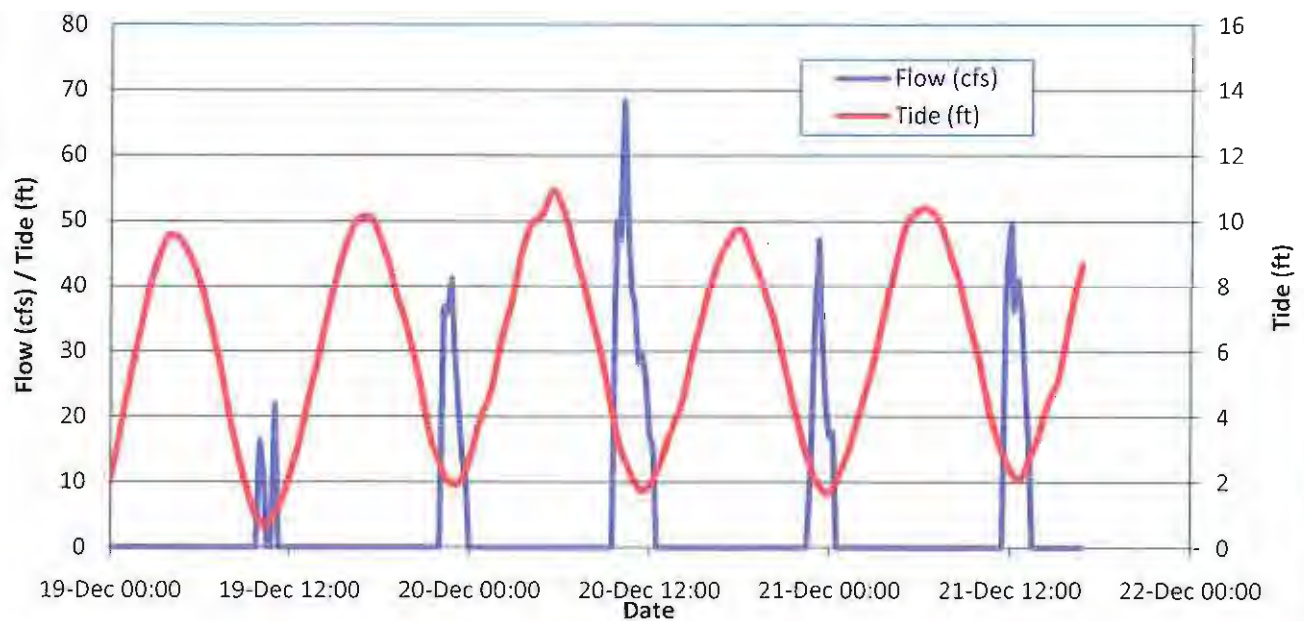
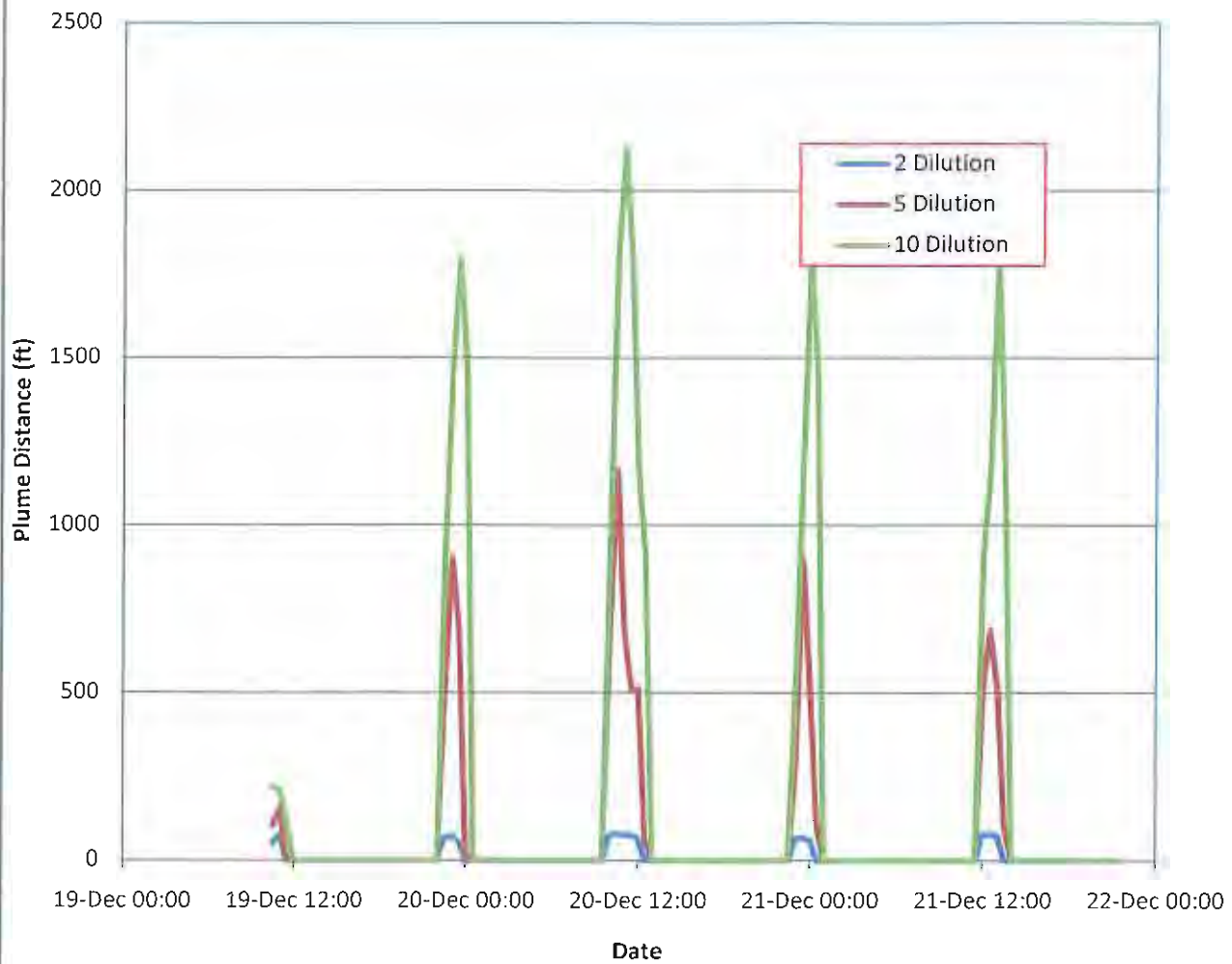


Figure 4.2-17 Plume Area and Discharge Flow at West Outfall, 11-12 January 2009 Event

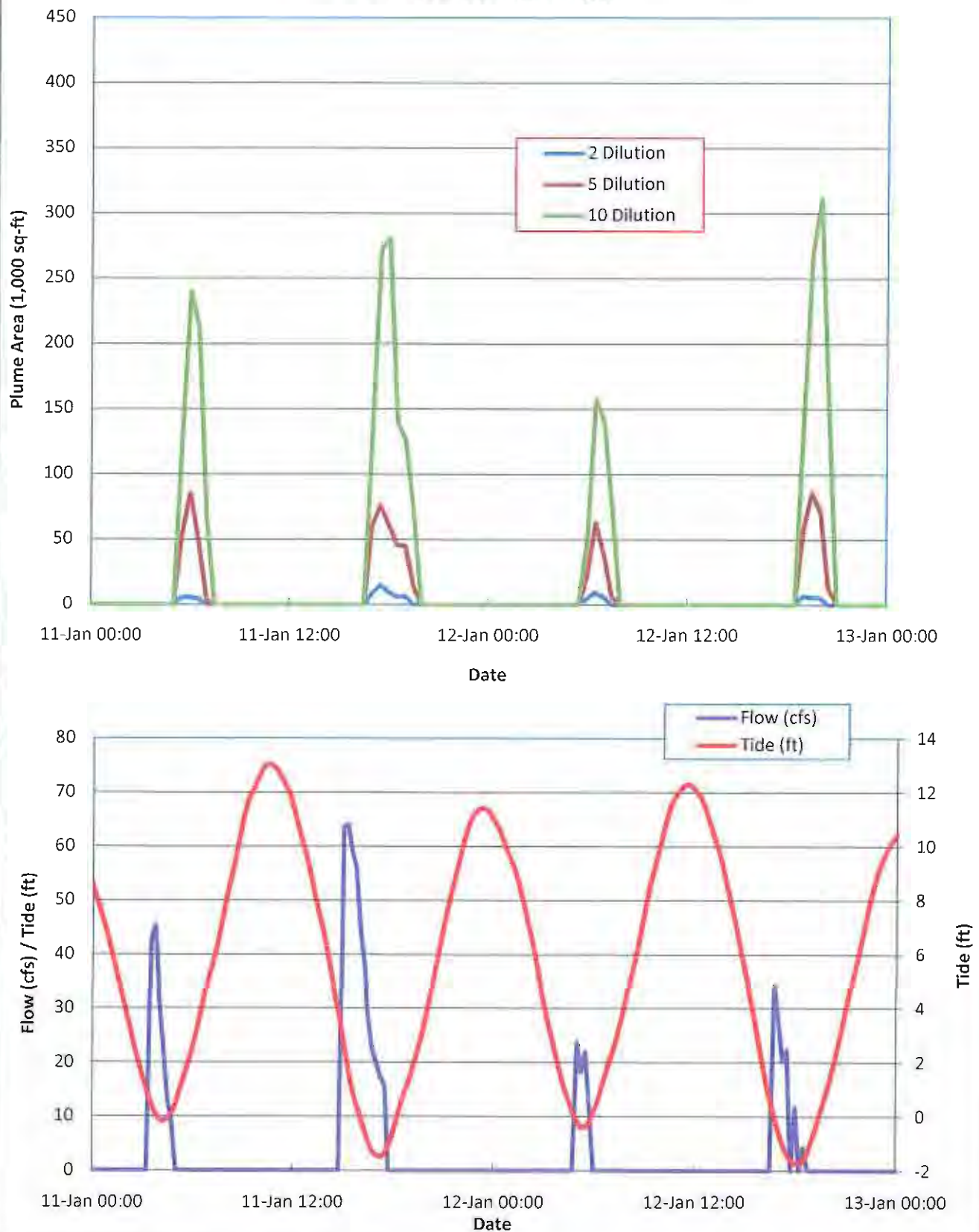


Figure 4.2-18 Plume Distance and Discharge Flow at West Outfall, 11-12 January 2009 Event

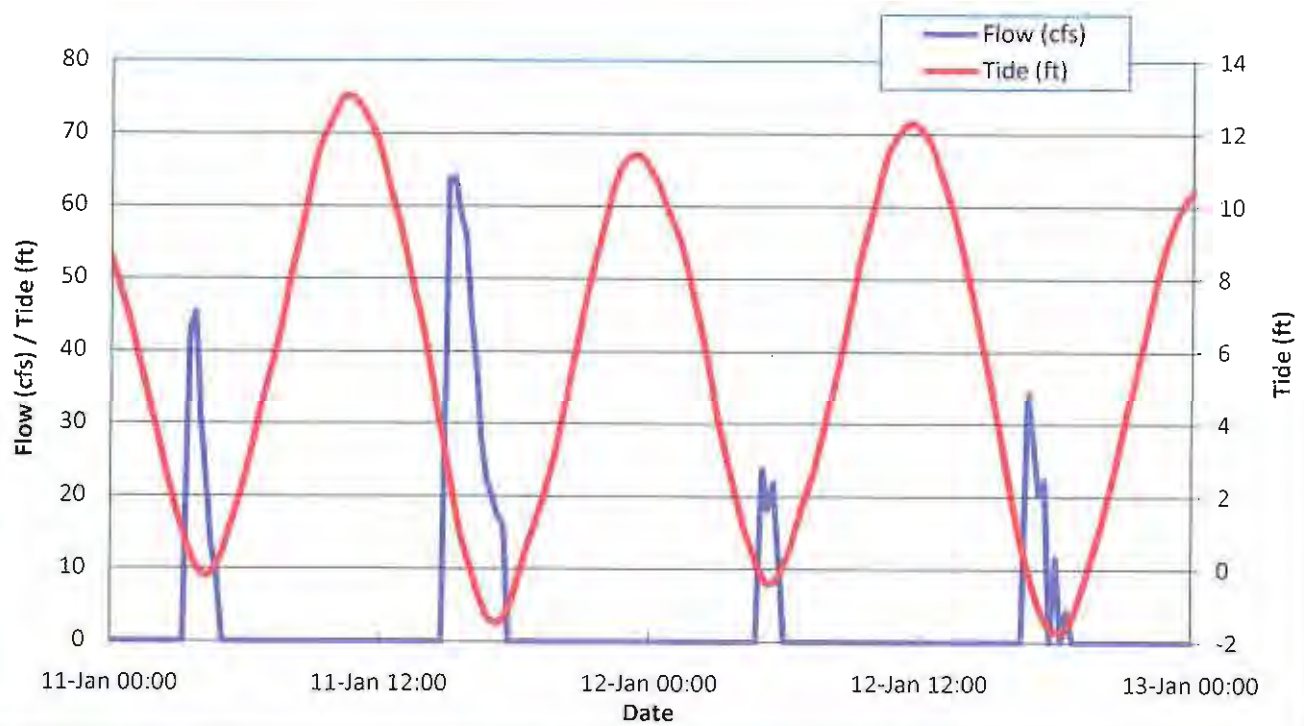
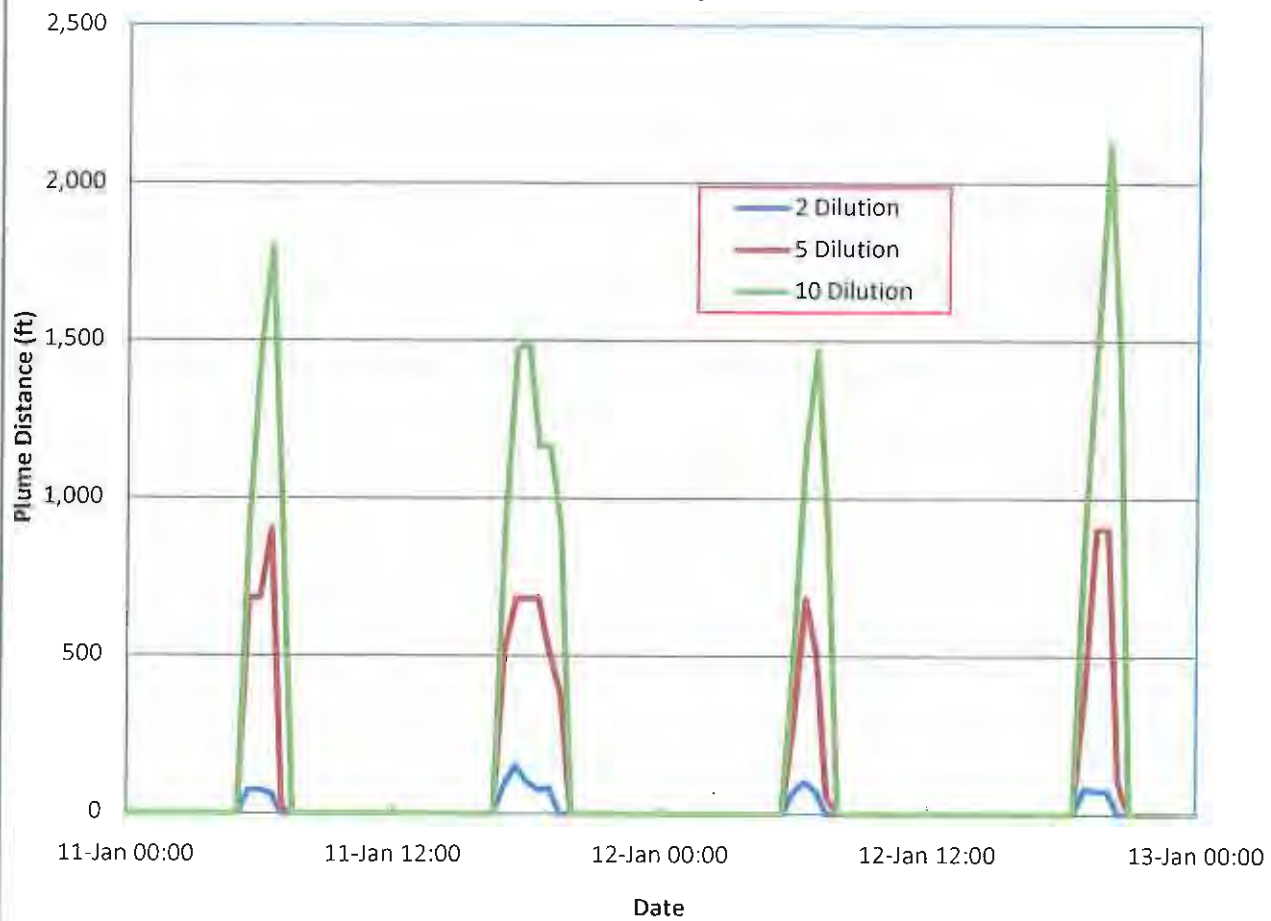


Figure 4.2-19 Plume Area and Discharge Flow at West Outfall, 28-30 January 2009 Event

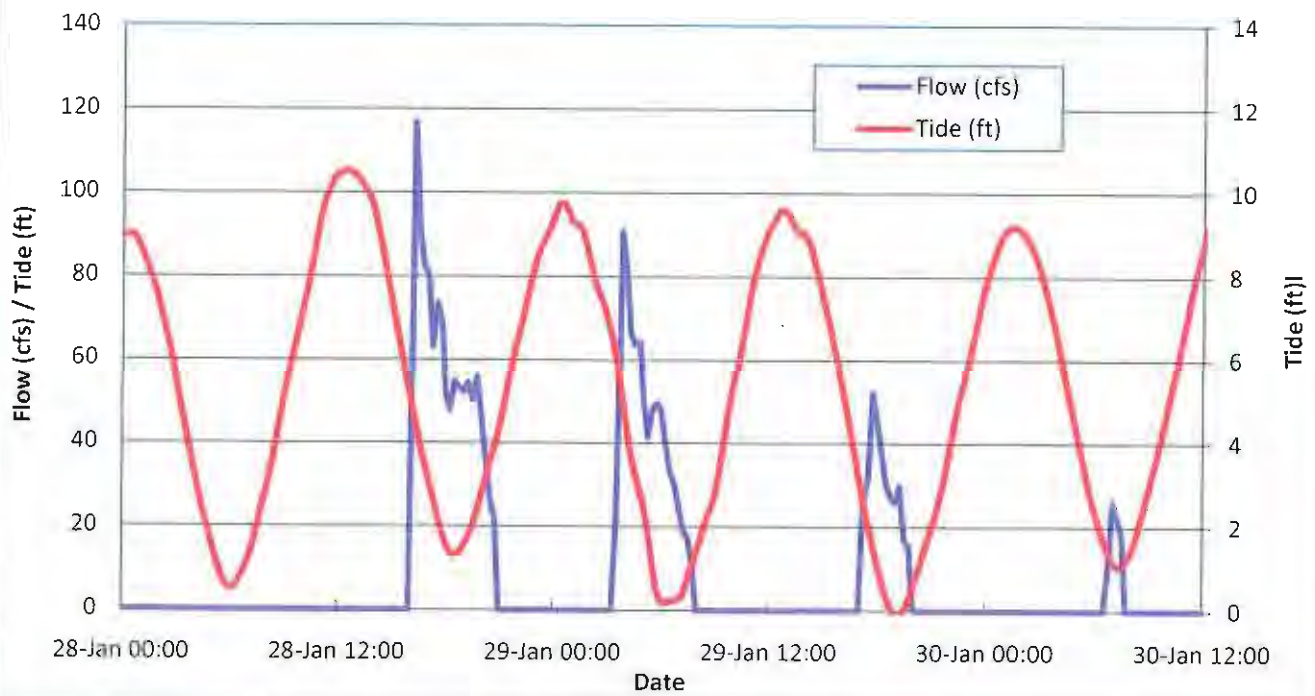
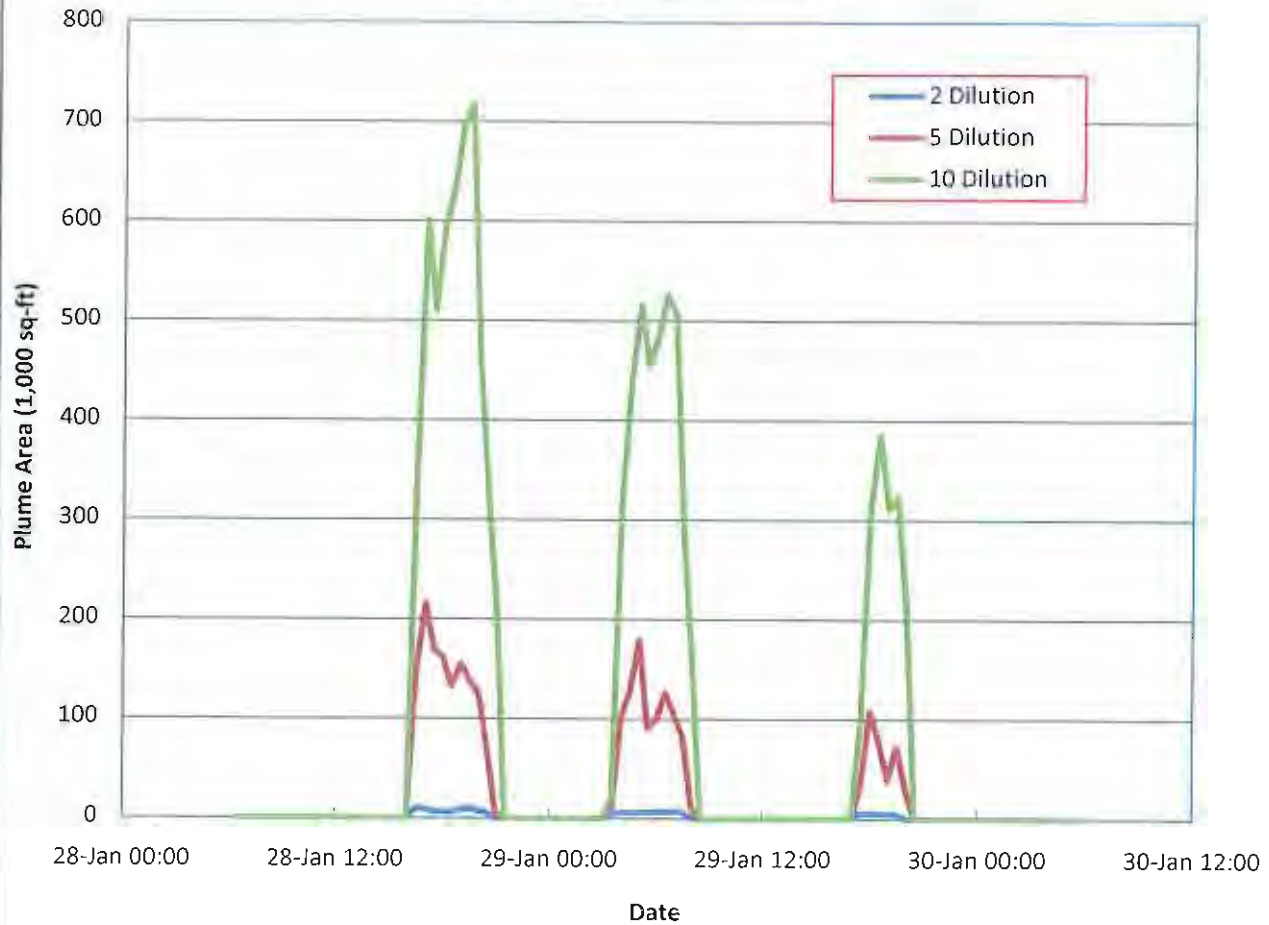
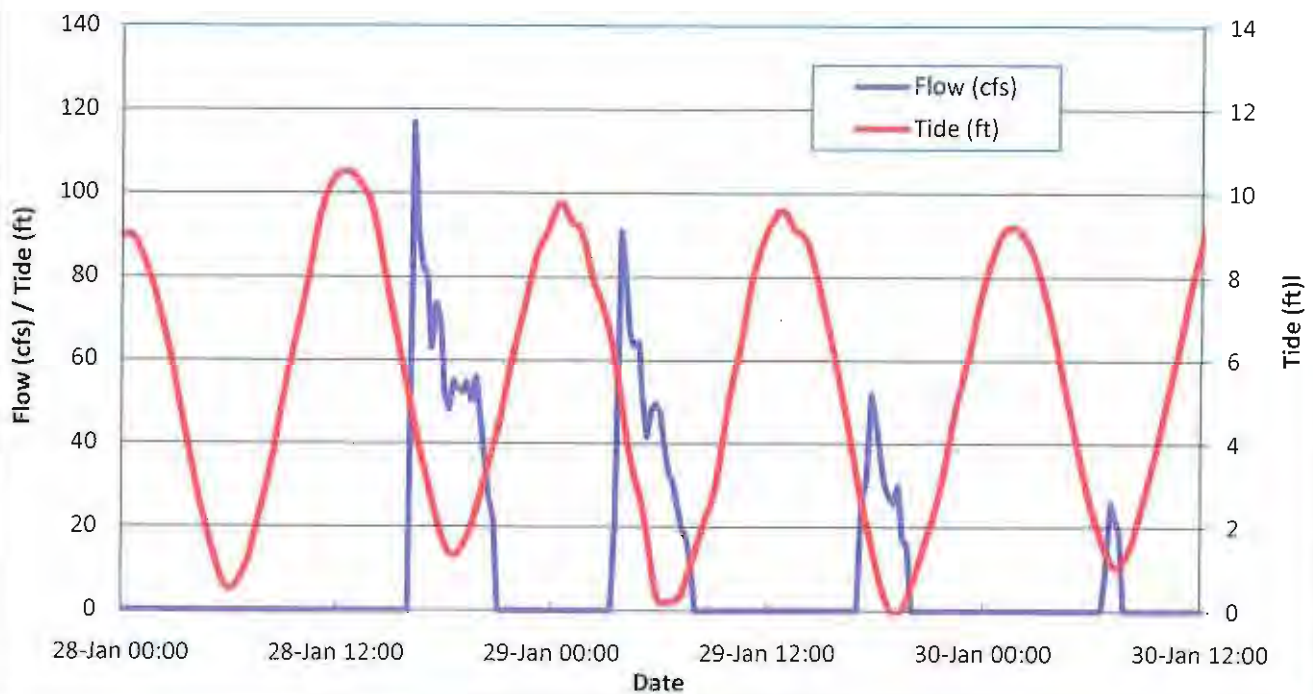
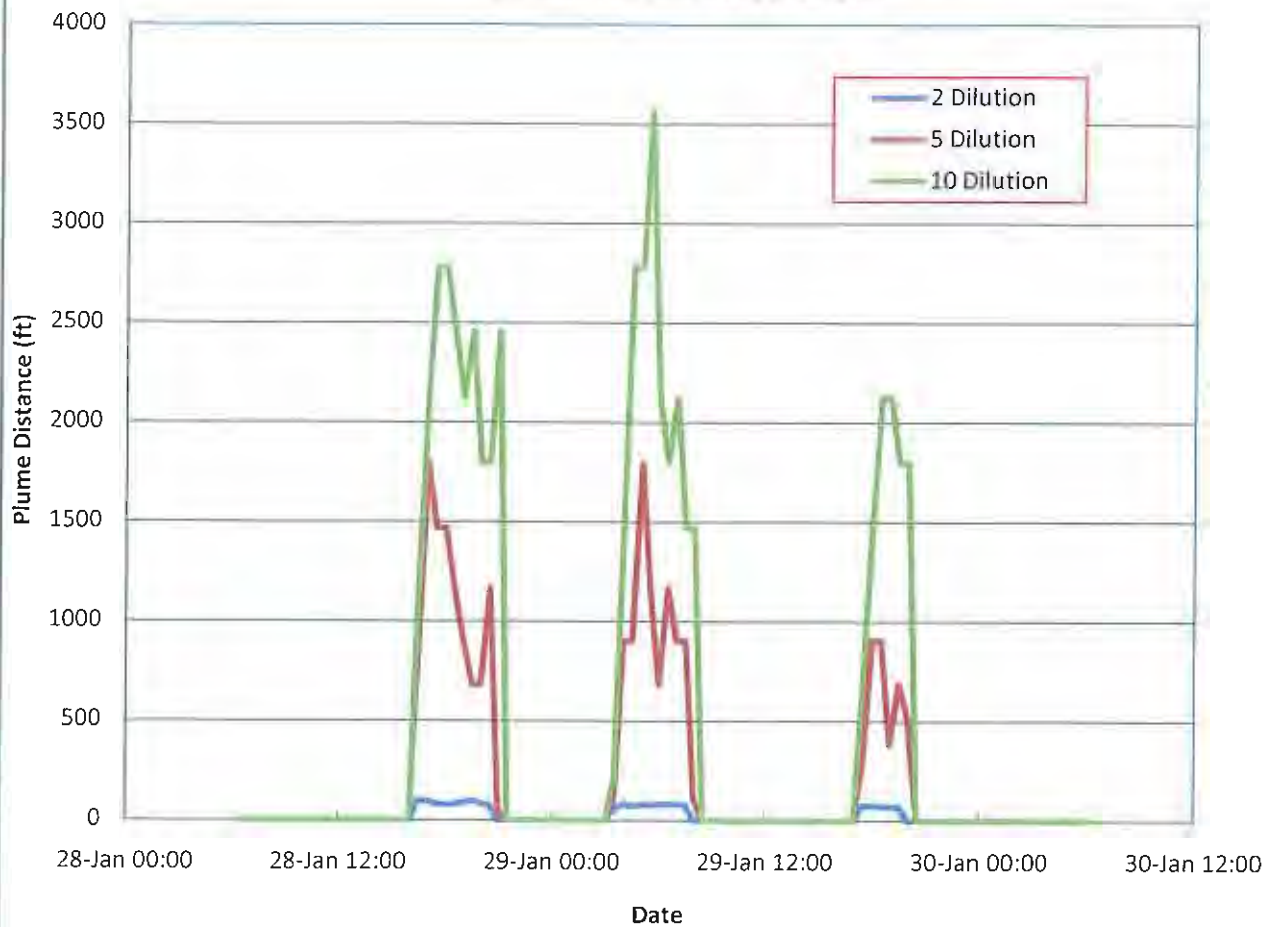


Figure 4.2-20 Plume Distance and Discharge Flow at West Outfall, 28-30 January 2009 Event



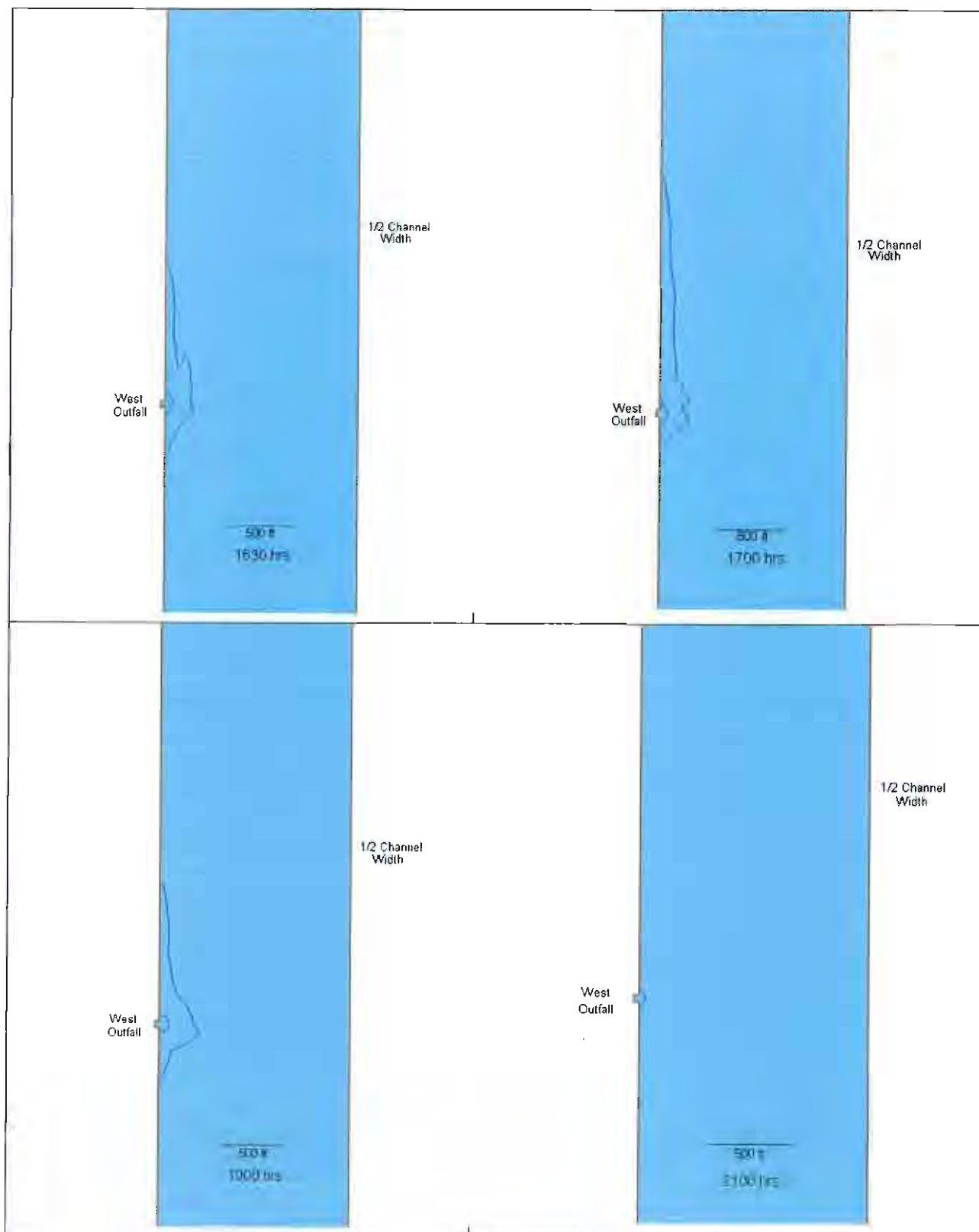
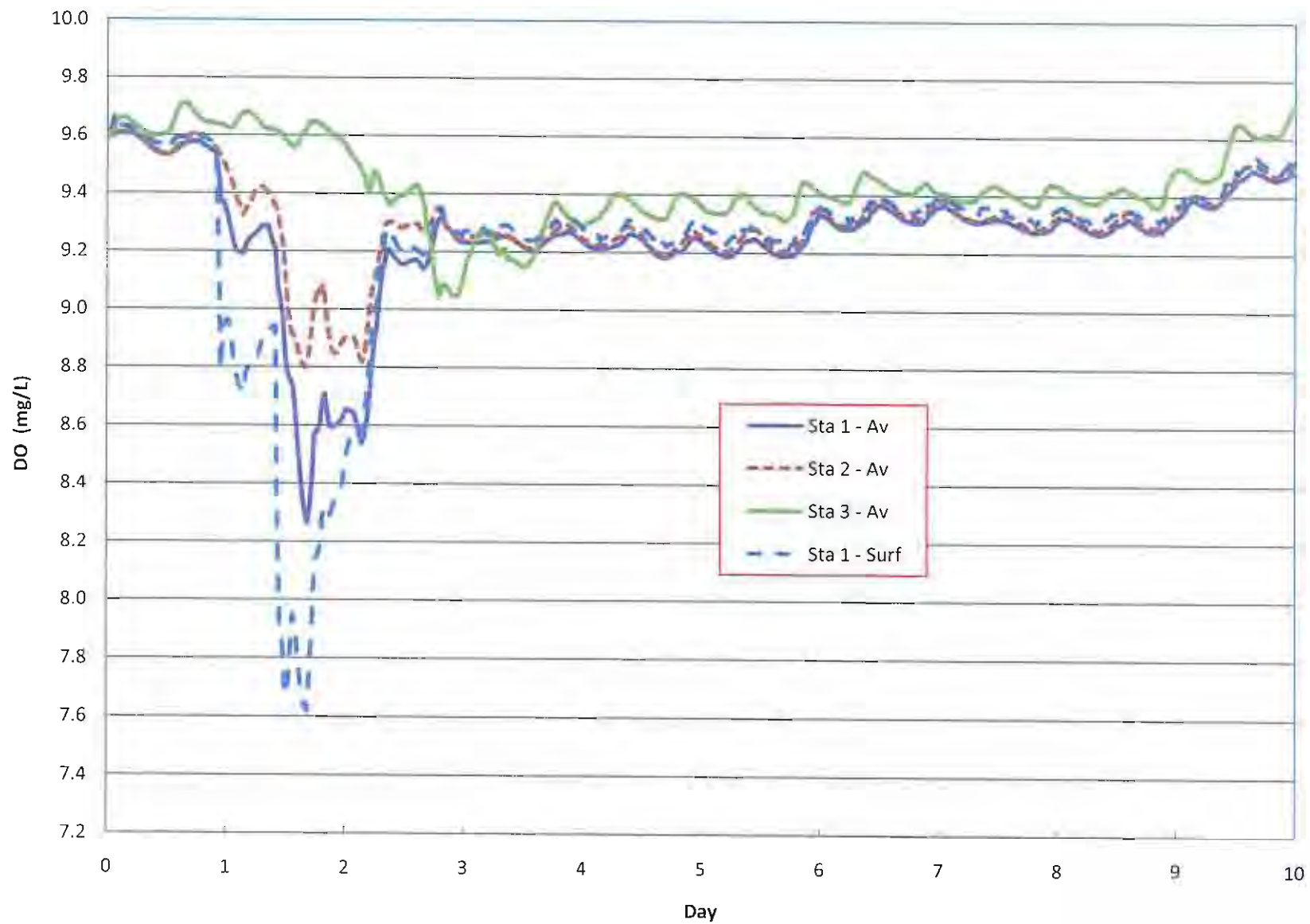
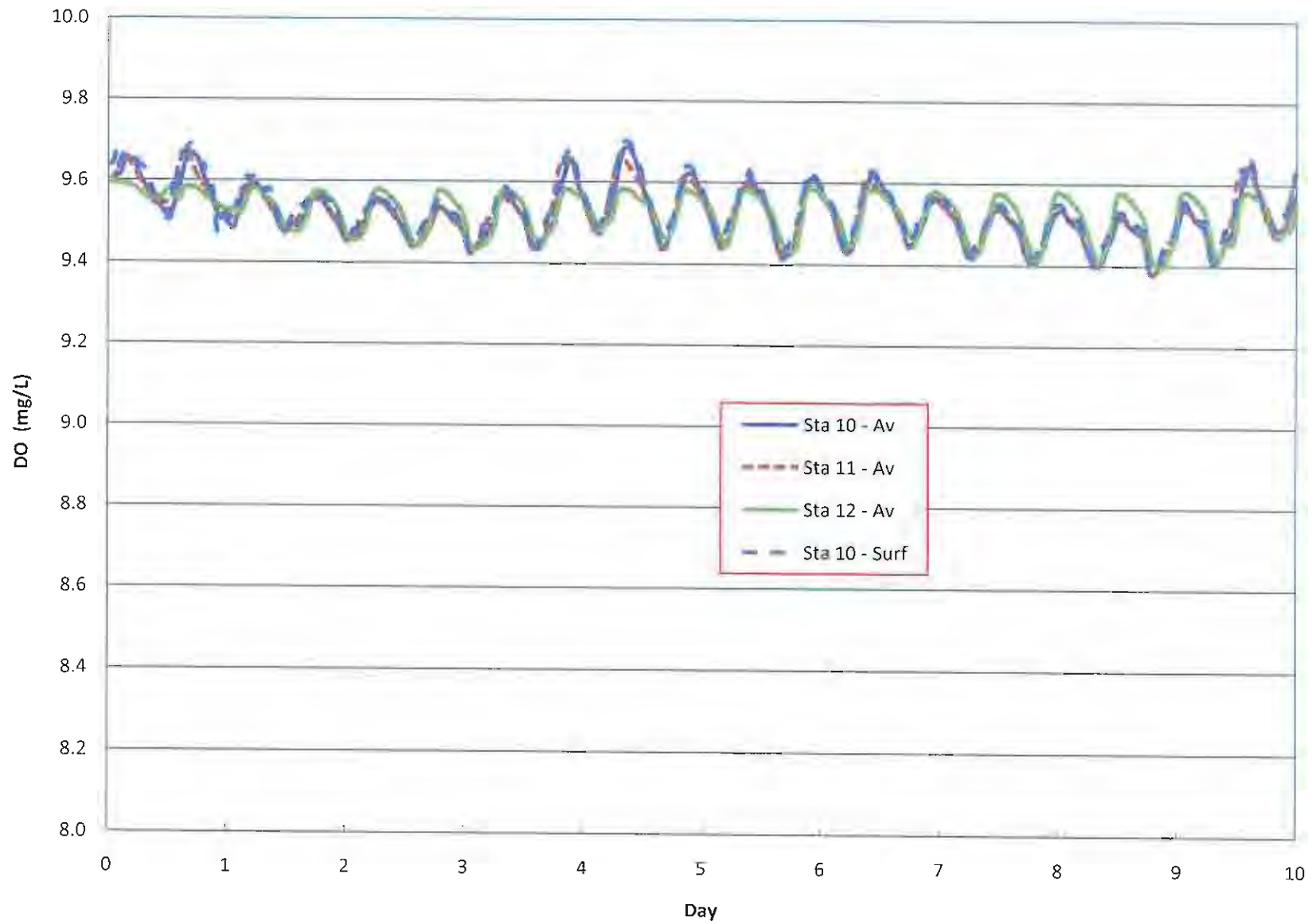


Figure 4.2-21 Factor of 2 and 5 Dilution Contours at West Outfall, 28 January 2009

**Figure 4.3-2 Water Column Average DO at 3 Stations Adjacent to North Outfall,
19-28 December 2008**



**Figure 4.3-3 Water Column Average DO at 3 Stations Adjacent to Outfall A21,
19-28 December 2008**



**Figure 4.3-4 Water Column Average DO at 5 Stations Along Winthrop Bay,
19-28 December 2008**

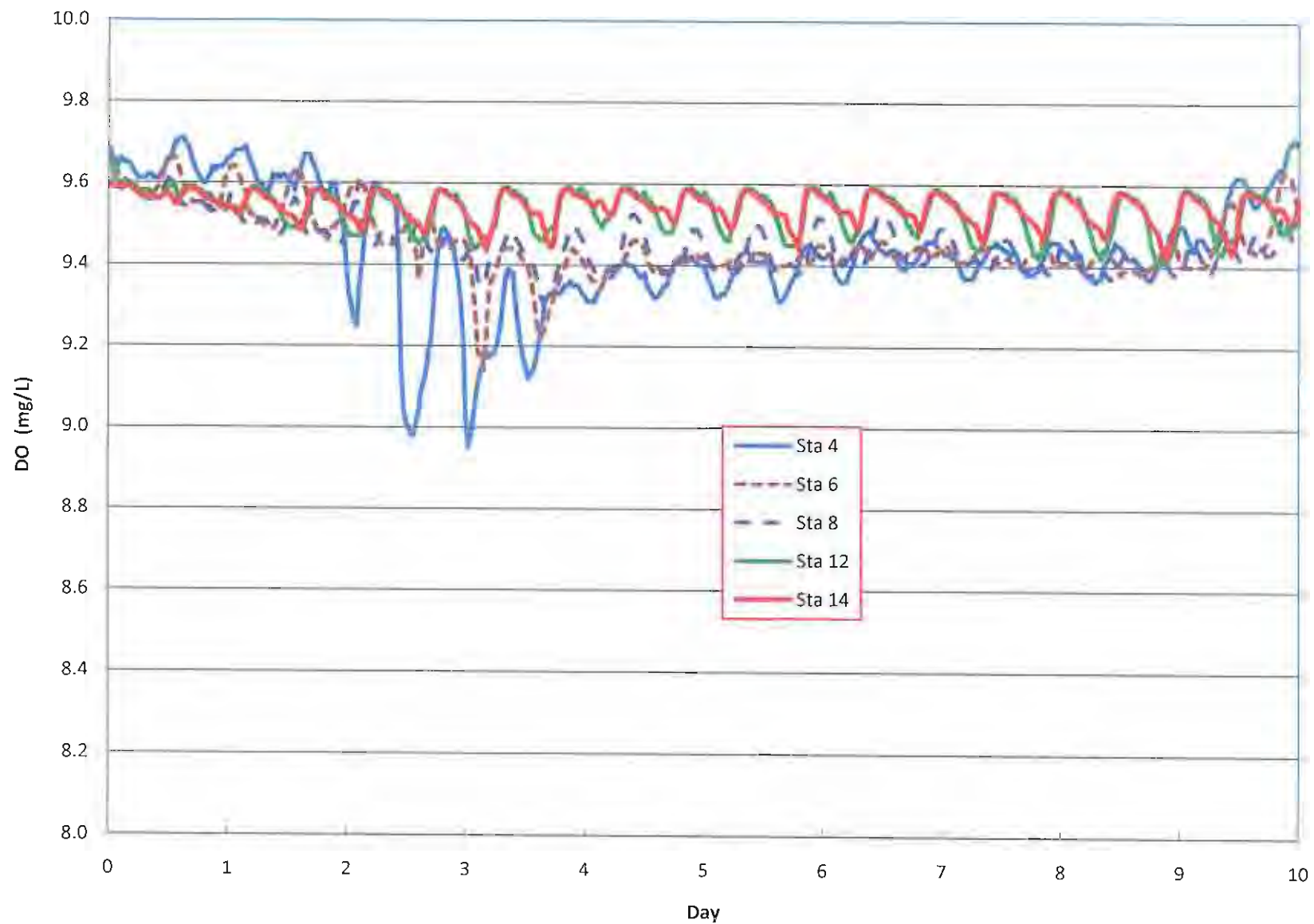
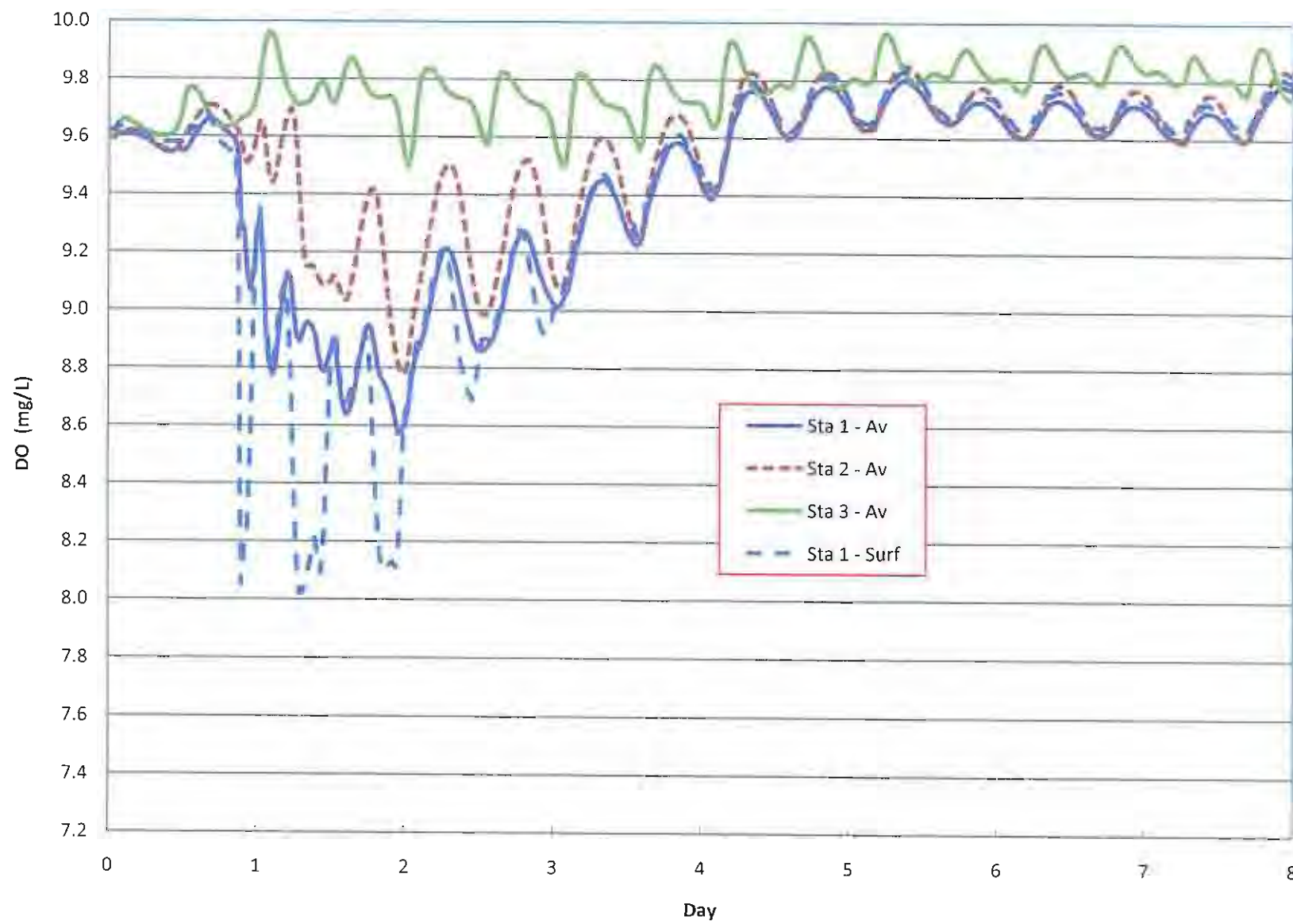
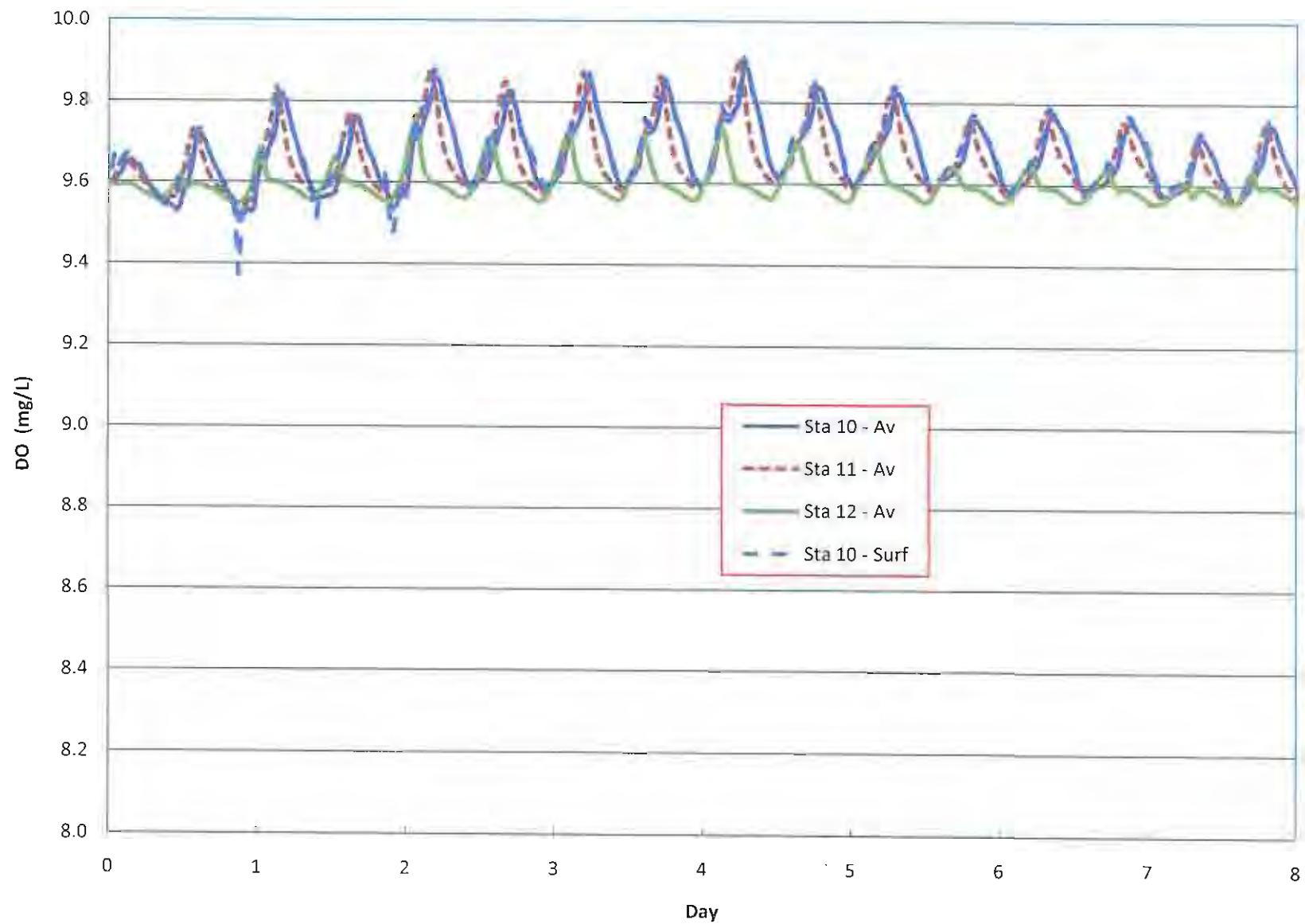


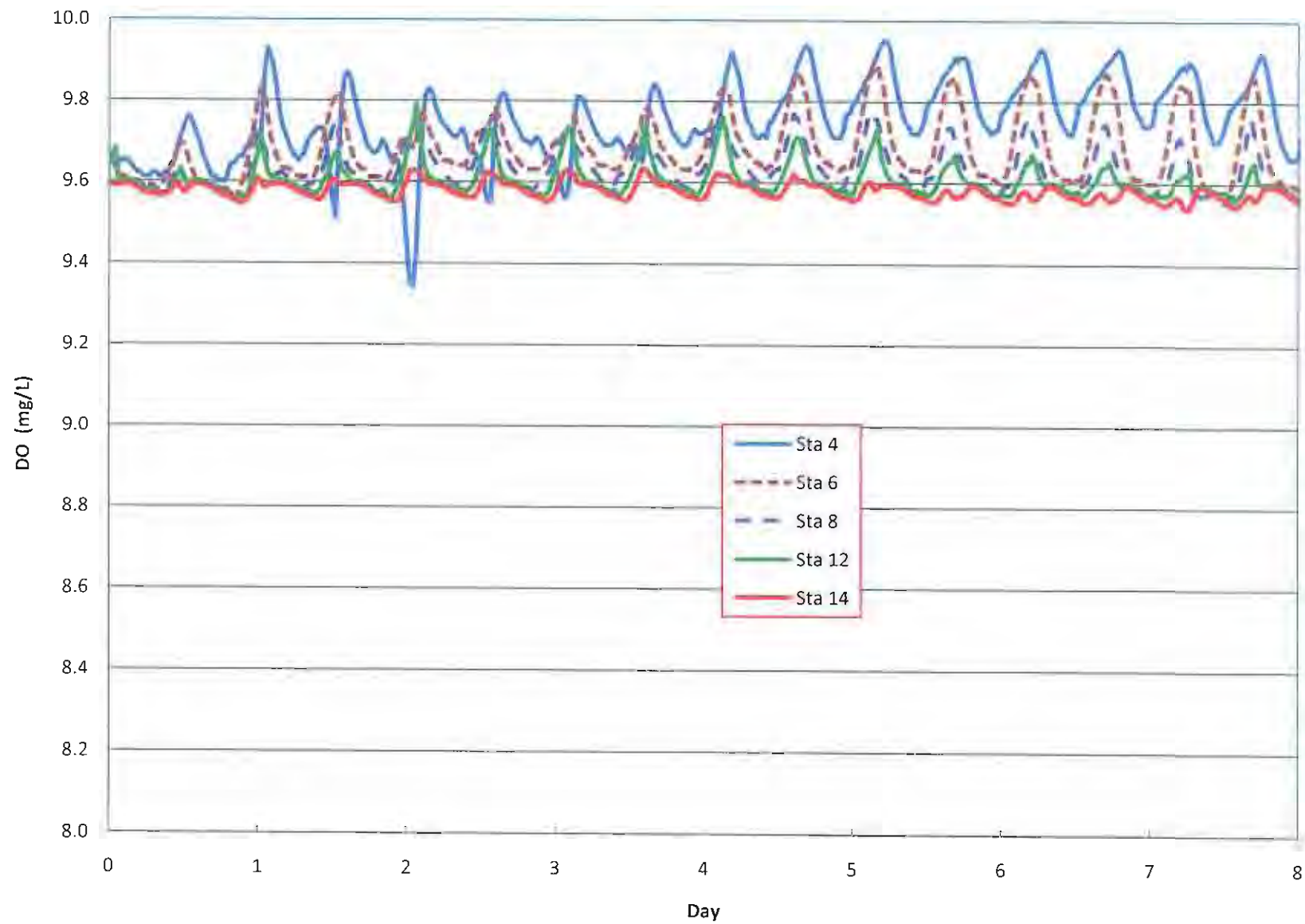
Figure 4.3-5 Water Column Average DO at 3 Stations Adjacent to North Outfall,
11-18 January 2009



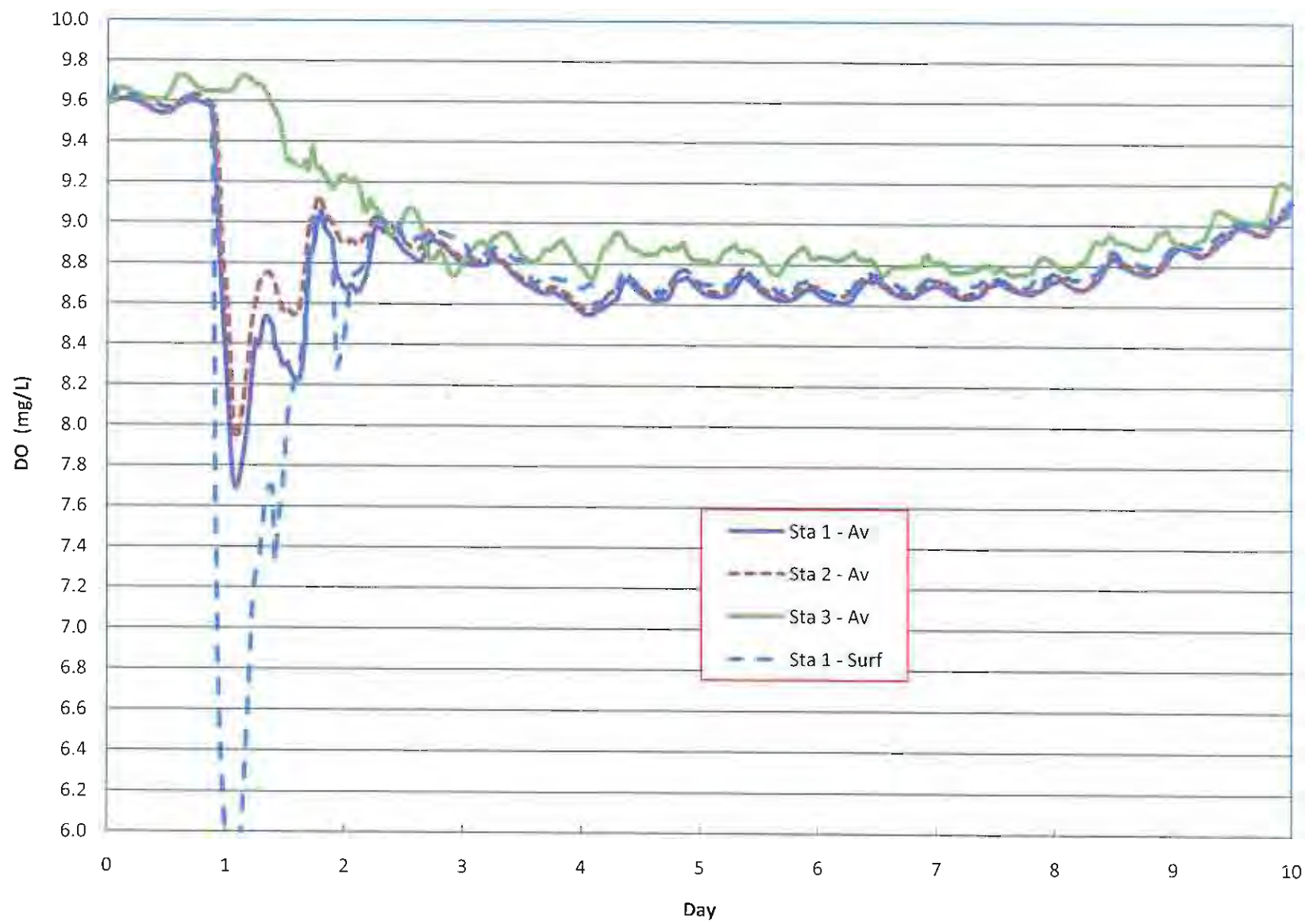
**Figure 4.3-6 Water Column Average DO at 3 Stations Adjacent to Outfall A21,
11-18 January 2009**



**Figure 4.3-7 Water Column Average DO at 5 Stations Along Winthrop Bay,
11-18 January 2009**



**Figure 4.3-8 Water Column Average DO at 3 Stations Adjacent to North Outfall,
28 January - 6 February 2009**



**Figure 4.3-9 Water Column Average DO at 3 Stations Adjacent to Outfall A21,
28 January - 6 February 2009**

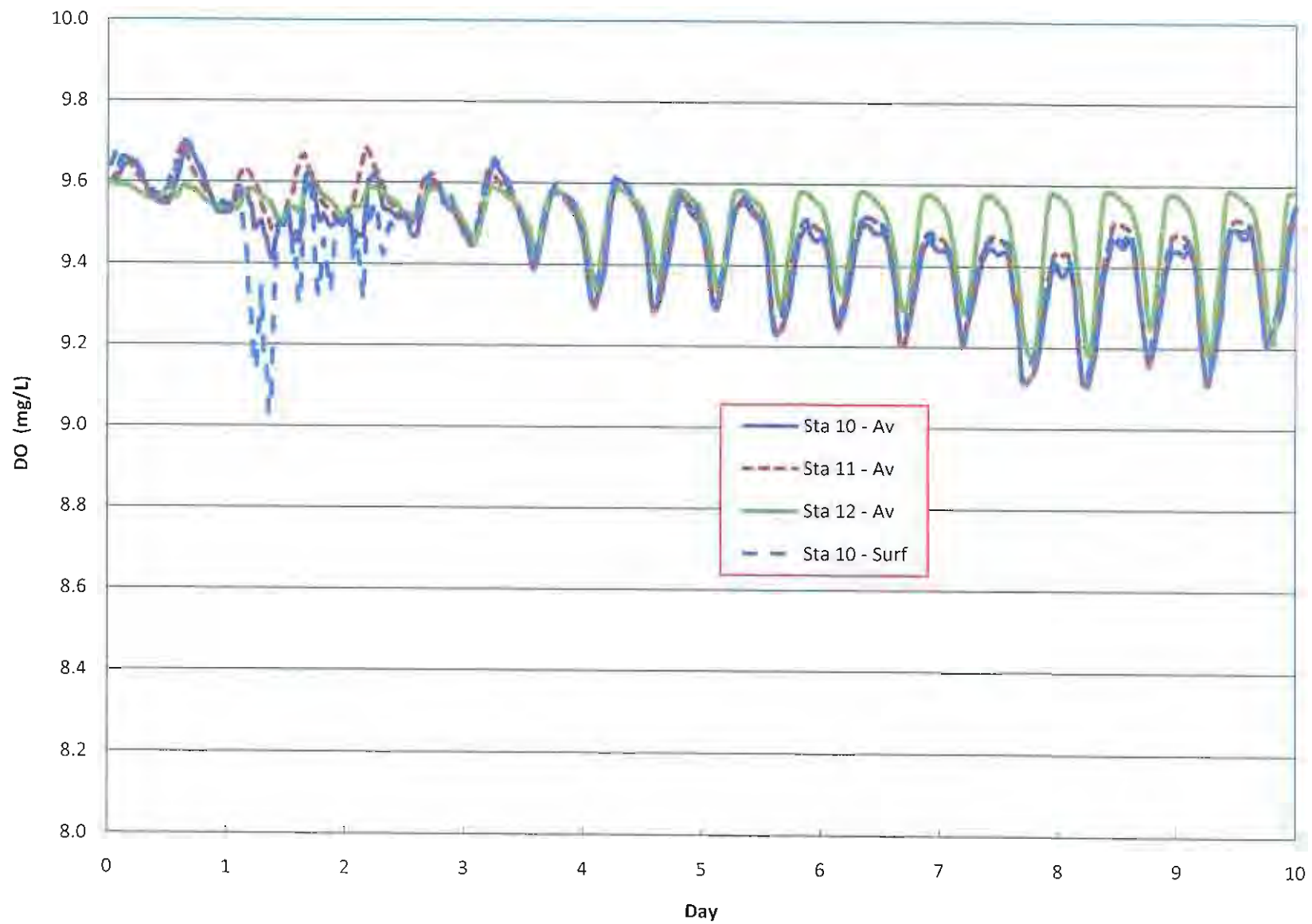
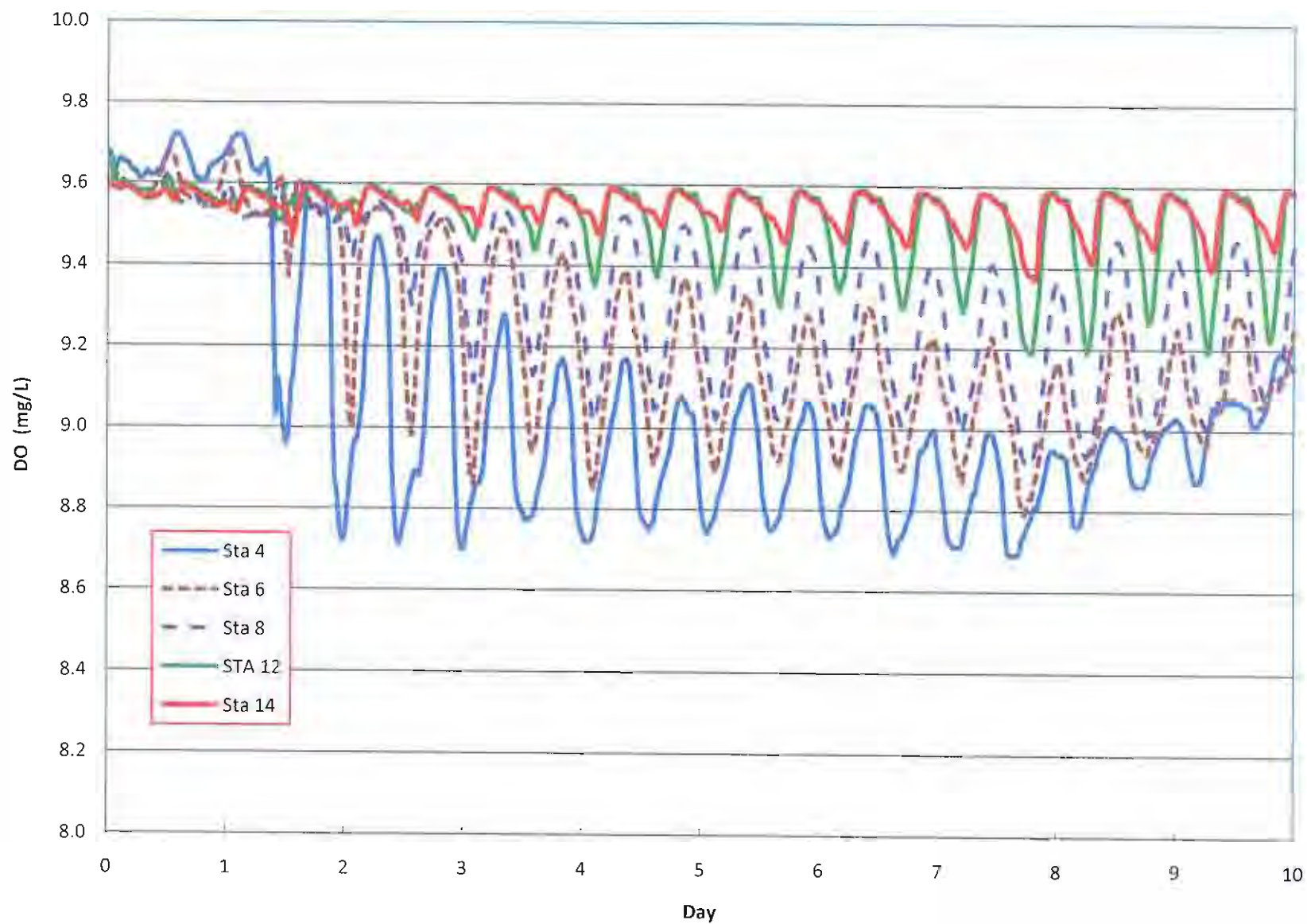


Figure 4.3-10 Water Column Average DO at 5 Stations Along Winthrop Bay,
28 January - 6 February 2009



TABLES

Table 1-1 Water Quality Study Compliance with Section D.1. Receiving Waters Analysis and Water Quality Study Report

Section D.1 Requirement	How requirement was addressed in the Water Quality Study
Analysis of Quantities of Deicer Used	Section 3.1 Aircraft and Airfield Deicing Reports on the program to collect daily deicer usage data through the 2008-2009 season.
Analysis of the concentration of deicer chemicals in direct and indirect surface water discharges	Section 3.2 Describes the discharge monitoring program for the 2008-2009 season and reports concentrations of deicer related chemicals in discharge waters.
Develop, calibrate, verify, and use a deicer application, fate, and transport model	Section 3.1 The ADMM model was used to estimate deicer use in the historic record and to put the 2008-2009 actual use data in the context of that record. Since this analysis shows that the storms monitored in the 2008-2009 season represented the greater than 95 percentile usage events, the further assessment of impacts on water quality was based on discharge monitoring data collected in the 2008-2009 season. The ADMM and SWMM models are being refined and calibrated against the monitoring data for use in future evaluations.
Predict the location and duration of ambient receiving water deicer chemical concentrations based on deicer use, results of the outfall sampling, and the range of deicer loadings that are likely to occur at Logan Airport.	Section 4.0 describes the dilution modeling of each of the receiving waters including presentation of dilution contours and estimates of duration of exposure to outfall plumes. As noted above deicer loadings were based on the actual monitored events since they represent greater than 95 percentile of deicer use.
Predict ambient surface water concentrations of deicer chemicals and dissolved oxygen in receiving waters based on measured outfall concentrations of deicer and the use of the verified application, fate and transport model.	Section 3.2.3 describes the estimated concentration of deicer chemicals in receiving waters; Section 4.3 describes the analysis of potential dissolved oxygen impacts in Winthrop Bay; the Phase 1 investigation concluded that there would not be an impact to dissolved oxygen in greater Boston Harbor as reported in Section 1.4.
Assess the ability of the receiving waters to meet their designated uses including assessment of impacts to aquatic life and fishing, shellfishing, and recreation.	Section 5 Table 5-1 summarizes findings regarding the Massachusetts criteria for determining ability of waters to support designated uses.
The analysis shall take into account the seasonal nature of deicer use activities, including the effects of snow melt.	The analysis is consistently conservative since accepted evaluation criteria are designed to assess impacts of continuous discharges and the deicer laden stormwater is both episodic and limited in duration. Only potential for acute effects on aquatic biota are relevant to evaluation of the stormwater discharges.

Table 1-1 Water Quality Study Compliance with Section D.1. Receiving Waters Analysis and Water Quality Study Report

Contour maps and cross- sections depicting the location and duration of ambient surface water concentrations of deicer compounds and dissolved oxygen based on various tidal, storm and deicer application scenarios.	The figures in Section 4 illustrate the geographical extent and duration of the discharge plume as modeled based on the monitoring data obtained in the 2008-2009 season. As previously noted, the monitored storms represent the 95 percentile deicer use conditions.
Procedures, assumptions, and protocols used in the Water Quality Study shall be consistent with those of EPA and / or Mass DEP if applicable.	EPA and/or MassDEP accepted test methods and evaluation criteria were used throughout the study as described particularly in Section3; modeling analyses were also conducted with agency accepted programs. The use of accepted protocols and criteria results in a conservative bias as they are based on continuous longer term exposure assumptions than are the case with the discharges evaluated in this study. The WET testing protocols specify continuous 48 hour exposure. A test that allows for representative dilution over the exposure period would more accurately reflect potential impacts in the receiving water impacts. Chemical criteria for protection of aquatic life are derived from continuous longer term exposure test results and also are conservative when applied to the discharges under investigation here.
Submit a plan and schedule for the Water Quality Study to EPA and MassDEP within six months of the effective date of the permit	Submitted prior to March 28, 2008
Prepare a Water Quality Study Report presenting the data collected, methodologies, procedures and results of the Water Quality Study and submit the report to EPA and MassDEP for review and comment with 24 months of the effective date of the permit	This Water Quality Study Report is being submitted by September 28, 2009.

Table 2-1 Summary of Boston Harbor Dissolved Oxygen Data

	Dissolved Oxygen Summary Data (mg/L)							
	MWRA Station 24		MWRA Station 130		MWRA Station 138		NEAQ[*]	
	(920 feet from Logan)		(550 feet from Logan)		(4,700 feet from Logan)		(5,500 feet from Logan)	
	Entire Year	Deicing Season	Entire Year	Deicing Season	Entire Year	Deicing Season	Entire Year	Deicing Season
Minimum	3.1	5.8	5.3	6.4	4.7	5.0	5.9	6.4
Maximum	15.1	15.1	14.7	14.7	15.5	15.5	15.7	15.7
Average	8.4	9.2	8.5	9.3	8.3	9.3	9.2	10.2
Standard Deviation	1.4	1.6	1.5	1.5	1.7	1.8	1.8	1.5
Number of observations	1,697	600	641	290	855	390	934	570

Sources: MWRA and NEAQ

^{*} Adjacent to MWRA Station 138

Table 2-2 Summary of Available Ammonia (NH₃) and Total Dissolved Nitrogen (TDN) Data in Boston Harbor Waters Adjacent to Logan Airport after the Deer Island Treatment Facility went Online (all concentrations in µM)

	MWRA Station 24 (Boston Inner Harbor)				MWRA Station 130 (Winthrop)				MWRA Station 138 (Jeffries Cove)			
	Entire Year		Deicing Season		Entire Year		Deicing Season		Entire Year		Deicing Season	
	NH ₃	TDN	NH ₃	TDN	NH ₃	TDN	NH ₃	TDN	NH ₃	TDN	NH ₃	TDN
Prior to Implementation of Mass Bay Outfall												
Min	0.1	7.6	0.8	11.3	0.1	8.7	0.4	11.9	0.1	7.8	1.0	11.2
Max	31.5	69.2	25.0	69.2	26.0	48.8	24.0	48.0	22.4	130.0	22.4	130.0
Average	6.8	26.4	8.9	31.6	8.0	25.0	11.0	29.4	8.1	32.0	9.9	37.7
Standard Deviation	5.1	10.8	5.1	9.6	7.0	10.5	7.9	10.4	5.1	14.5	5.3	14.7
Post-Implementation of Mass Bay Outfall												
Min	0.0	6.8	0.0	6.8	0.0	1.3	0.0	1.3	0.0	6.8	0.0	6.8
Max	6.6	39.3	6.6	39.3	12.8	36.5	12.8	36.5	10.8	58.1	8.4	57.7
Average	1.4	18.5	1.7	21.4	1.1	14.9	1.4	16.8	2.5	24.1	2.5	27.2
Standard Deviation	1.5	7.0	1.6	6.5	1.5	5.4	1.8	5.8	1.9	8.8	1.9	8.1

Source: MWRA

Table 2-3 Summary of Temperature, Salinity, and Dissolved Oxygen Profiles in Boston Harbor Waters Adjacent to Logan Airport

Station	Depth Interval	Statistics	Depth of Measurement (m)	Temperature (°C)	Salinity (PSU)	Dissolved Oxygen (mg/L)	DO Saturation (%)
MWRA Station 24 Boston Inner Harbor (920 feet from Logan)	<i>Surface</i>	min	0.10	-1.46	6.10	5.9	67.44
		max	3.90	17.87	32.85	14.4	134.00
		average	0.27	7.84	28.90	9.3	92.42
		std dev	0.22	4.38	2.69	1.6	9.47
	<i>Bottom</i>	min	3.60	-1.30	5.06	5.8	65.10
		max	16.95	16.29	32.90	15.1	131.40
		average	11.97	7.56	30.81	9.0	90.29
		std dev	2.15	4.05	1.93	1.5	9.90
MWRA Station 130 Winthrop (550 feet from Logan)	<i>Surface</i>	min	0.10	-1.85	24.62	6.5	70.30
		max	0.31	17.02	32.86	14.7	119.60
		average	0.29	6.82	30.75	9.4	92.42
		std dev	0.04	4.73	1.24	1.5	8.73
	<i>Bottom</i>	min	3.50	-1.87	27.75	6.4	68.70
		max	8.33	16.85	32.87	12.0	116.10
		average	6.22	6.75	30.98	9.2	90.00
		std dev	1.12	4.61	1.01	1.4	8.81
MWRA Station 138 Jeffries Cove (4,700 feet from Logan)	<i>Surface</i>	min	0.10	-1.00	7.32	6.2	65.10
		max	0.45	17.70	32.23	14.3	125.70
		average	0.25	7.30	27.43	9.5	91.67
		std dev	0.09	4.58	3.47	1.8	10.28
	<i>Bottom</i>	min	5.98	-1.24	4.23	5.0	57.90
		max	16.95	16.39	32.67	15.5	142.00
		average	9.12	6.74	30.61	9.1	89.02
		std dev	1.77	4.32	2.23	1.7	11.54

Source: MWRA

Table 2-4 Species and Life Stage for which EFH has been Designated In Boston Harbor

Species	Eggs	Larvae	Juveniles	Adults
Atlantic cod (<i>Gadus morhua</i>)	X	X	X	X
haddock (<i>Melanogrammus aeglefinus</i>)	X	X	—	—
Pollock (<i>Pollachius virens</i>)	X	X	X	X
Whiting (<i>Merluccius bilinearis</i>)	X	X	X	X
Offshore hake (<i>Merluccius albidus</i>)	—	—	—	—
Red hake (<i>Urophycis chuss</i>)	X	X	X	X
White hake (<i>Urophycis tenuis</i>)	X	X	X	X
Redfish (<i>Sebastes fasciatus</i>)	n/a	—	—	—
Witch flounder (<i>Glyptocephalus cynoglossus</i>)	—	—	—	—
Winter flounder (<i>Pleuronectes americanus</i>)	X	X	X	X
Yellowtail flounder (<i>Pleuronectes ferruginea</i>)	X	X	X	X
Windowpane flounder (<i>Scopthalmus aquosus</i>)	X	X	X	X
American plaice (<i>Hippoglossoides platessoides</i>)	X	X	X	X
Ocean pout (<i>Macrozoarces americanus</i>)	X	X	X	X
Atlantic halibut (<i>Hippoglossus hippoglossus</i>)	X	X	X	X
Atlantic sea scallop (<i>Placopecten magellanicus</i>)	X	X	X	X
Atlantic sea herring (<i>Clupea harengus</i>)	—	X	X	X
Monkfish (<i>Lophius americanus</i>)	—	—	—	—
Bluefish (<i>Pomatomus saltatrix</i>)	—	—	—	—
Long finned squid (<i>Loligo pealei</i>)	n/a	n/a	X	X
Short finned squid (<i>Illex illecebrosus</i>)	n/a	n/a	X	X
Atlantic butterflyfish (<i>Peprilus triacanthus</i>)	X	X	X	X
Atlantic mackerel (<i>Scomber scombrus</i>)	X	X	X	X
Summer flounder (<i>Paralichthys dentatus</i>)	—	—		X
Scup (<i>Stenotomus chrysops</i>)	n/a	n/a	X	X
Black sea bass (<i>Centropristus striata</i>)	n/a	—	X	X
Surf clam (<i>Spisula solidissima</i>)	n/a	n/a	X	X
Ocean quahog (<i>Artica islandica</i>)	n/a	n/a	—	—
Spiny dogfish (<i>Squalus acanthias</i>)	n/a	n/a	—	—
Tilefish (<i>Lopholatilus chamaeleonticeps</i>)	—	—	—	—
Bluefin tuna (<i>Thunnus thynnus</i>)	—	—	X	X

Table 3-1 ADF/AAF Use and Snowfall Data for Major Events in the 2008-2009 Season

Day	Total Departures	% Reduction in Departures	Snowfall (in)	Reported ADF Use (gal)	Reported AAF Use (gal)	Rank in Total ADF/AAF Usage 2008-2009
12/19/2008	319	34%	8.8	44,393	10,279	4
12/20/2008	353	2%	3.7	37,695	11,712	10
12/21/2008	254	35%	3.8	37,680	12,855	9
12/31/2008	284	39%	6.5	36,253	10,423	12
1/11/2009	340	14%	4.8	47,961	5,834	7
1/18/2009	269	32%	9.3	71,000	16,330	1
1/19/2009	420	9%	3.1	62,112	2,959	2
1/28/2009	299	35%	4.3	45,468	8,652	6
2/3/2009	355	26%	4.2	45,181	13,836	3
3/2/2009	189	59%	6.9	39,729	8,951	11
3/9/2009	432	6%	2.2	42,473	10,183	8

Events in **Bold Type** were monitored during the 2008-2009 season.

Table 3-2 Inventory of Samples and Analyses for 2000-2009 Stormwater Monitoring Program
Logan International Airport

Date	North Outfall	Parameters	Toxicity Tests	West Outfall	Parameters	Toxicity Tests	A21	Parameters	Toxicity Tests
2/7/2008	External Outfall Sample	BOD, COD, Ethylene Glycol, Propylene Glycol, Ammonia, Nonylphenol, Tolytriazoles		External Outfall Sample	BOD, COD, Ethylene Glycol, Propylene Glycol, Ammonia, Nonylphenol, Tolytriazoles		No Data		
2/22/2008	External Outfall Sample	BOD, COD, Ethylene Glycol, Propylene Glycol, Ammonia, Nonylphenol, Tolytriazoles		External Outfall Sample	BOD, COD, Ethylene Glycol, Propylene Glycol, Ammonia, Nonylphenol, Tolytriazoles		No Data		
3/15/2008	External Outfall Sample	BOD, COD, Ammonia, TKN, COD, BOD, TSS, TS, TOC, Al, Cd, Cr, Cu, Ni, Pb, Zn	<i>Menidia beryllina</i> , <i>Arbacia punctulata</i>	External Outfall Sample	BOD, COD, Ammonia, TKN, COD, BOD, TSS, TS, TOC, Al, Cd, Cr, Cu, Ni, Pb, Zn	<i>Menidia beryllina</i> , <i>Arbacia punctulata</i>	No Data		
3/19/2008	External Outfall Sample	BOD, COD, Ethylene Glycol, Propylene Glycol, Ammonia, TKN, COD, BOD, TSS, TS, TOC, Al, Cd, Cr, Cu, Ni, Pb, Zn	<i>Menidia beryllina</i> , <i>Arbacia punctulata</i>	External Outfall Sample	BOD, COD, Ethylene Glycol, Propylene Glycol, Ammonia, TKN, COD, BOD, TSS, TS, TOC, Al, Cd, Cr, Cu, Ni, Pb, Zn	<i>Menidia beryllina</i> , <i>Arbacia punctulata</i>	No Data		
12/19/2008 13:00 to 12/20/08 12:00	Hourly ; Glycols every 2 hours	COD, Ethylene Glycol, Propylene Glycol, Ammonia, TKN		Hourly ; Glycols every 2 hours	COD, Ethylene Glycol, Propylene Glycol, Ammonia, TKN	<i>Mysidopsis bahia</i> , <i>Menidia beryllina</i>	Hourly ; Glycols every 2 hours	COD, Ethylene Glycol, Propylene Glycol, Ammonia, TKN	
1/11/2009 4:00 to 1/13/09 2:00	Every 2 hours; Glycols every four hours	COD, Ethylene Glycol, Propylene Glycol, Ammonia, TKN		Every 2 hours; Glycols every four hours	COD, Ethylene Glycol, Propylene Glycol, Ammonia, TKN		Every 2 hours; Glycols every four hours	COD, Ethylene Glycol, Propylene Glycol, Ammonia, TKN	
1/28/09 6:00 to 1/30 4:00	Every 2 hours; Glycols every four hours	COD, Ammonia, TKN (Glycol data not usable)		Every 2 hours; Glycols every four hours	COD, Ammonia, TKN (Glycol data not usable)		Every 2 hours; Glycols every four hours	COD, Ammonia, TKN (Glycol data not usable)	
3/2/2009	Composite of 4 Grabs at Station 18:58 to 22:58	COD, Ethylene Glycol, Propylene Glycol, Ammonia, TKN, Nonylphenols, Tolytriazoles	<i>Mysidopsis bahia</i> , <i>Menidia beryllina</i> , <i>Arbacia punctulata</i>						
3/3/2009	Composite of 4 Grabs at Station 7:58 to 11:58	COD, Ethylene Glycol, Propylene Glycol, Ammonia, TKN, Nonylphenols, Tolytriazoles	<i>Mysidopsis bahia</i> , <i>Menidia beryllina</i> , <i>Arbacia punctulata</i>				Composite of 4 Grabs at Station 8:58 to 12:58	COD, Ethylene Glycol, Propylene Glycol, Ammonia, TKN,	<i>Mysidopsis bahia</i> , <i>Menidia beryllina</i> , <i>Arbacia punctulata</i>

Table 3-3 Chemical Data in Samples at the Time of Discharge—West Outfall

SampleID	COD (mg/l)	Ethylene Glycol (mg/l)	Propylene Glycol (mg/l)	Ammonia-N (mg/l)	TKN-N (mg/l)
WEST-121908-22:00	2000	NA	NA	1.38	2.9
WEST-121908-23:00	8100	<1000	3200	1.58	4.5
WEST-122008-00:00	8800	NA	NA	1.68	4.1
WEST-122008-10:00	9200	NA	NA	0.939	5.1
WEST-122008-11:00	12000	<1000	2900	0.982	5.0
WEST-122008-12:00	9600	NA	NA	<3.75	6.8
Range for Event	450- 12000	<10- <1000	37-3200	0.73-1.84	<0.5- 6.8
WEST-011109-04:00	1500	<250	<250	6.68	10
WEST-011109-14:00	980	NA	NA	1.21	2.4
WEST-011109-16:00	23000	1800	6600	1.68	9.1
WEST-011209-04:00	5000	1200	2900	0.483	2
WEST-011209-16:00	5000	<500	1400	0.859	2.5
Range for Event	720- 30000	<50- 2800	<50-7800	0.483-6.68	2.0- 11.0
WEST-012809-16:00	1000	NA	NA	0.898	1.9
WEST-012809-18:00	4800	*	*	1.1	5.6
WEST-012809-20:00	1900	NA	NA	0.964	4.9
WEST-012909-04:00	860	NA	NA	2.5	6.4
WEST-012909-06:00	540	*	*	2.42	10
WEST-012909-18:00	1000	*	*	4.99	19
Range for Event	860- 14000	*	*	0.449-7.6	1.3-26

* Indicates that data were not usable for this parameter.

NA Indicates that the sample was not analyzed for this parameter.

Range for Event includes all samples collected within the stormwater system.

Table 3-4 Chemical Data in Samples at Time of Discharge – North Outfall

SampleID	COD (mg/l)	Ethylene Glycol (mg/l)	Propylene Glycol (mg/l)	Ammonia-N (mg/l)	TKN (mg/l)
North-012809-16:00	6700			1.14	9.1
North-012809-18:00	2200	*	*	1.26	8.7
North-012809-20:00	260			0.754	3.5
North-012809-22:00	1300	*	*	1.92	10
North-012909-06:00	1000	*	*	8.11	42
North-012909-16:00	1600			11.2	82
North-013009-4:00	1200	*	*	9	41
Range for Event	260-6700			0.75-12.6	3.5-82
North-011109-12:00	1500	200	360	3.43	12
North-011209-02:00	5300	NA	NA	0.588	3
North-011209-14:00	5400	NA	NA	1.33	4.2
Range for Event	1500-20000	<5-2500	<5-6900	0.47-16.6	3.5-82
North-121908-18:00	770	NA	NA	3.08	6.4
North-121908-19:00	760	<100	220	3.05	6.1
North-121908-20:00	880	NA	NA	2.49	6.3
North-122008-08:00	5800	NA	NA	0.663	3.1
North-122008-09:00	8900	2700	1600	0.420	<2.0
Range for Event	760-16000	<100-3400	190-3500	0.42-4.14	<2-7.4

* Indicates that data were not useable.

NA Indicates that sample was Not Analyzed for this parameter.

Range for Event includes all samples collected within the stormwater system.

Table 3-5 Chemical Data in Samples at Time of Discharge – A21 Outfall

Sample Identification	COD (mg/l)	Ethylene Glycol (mg/l)	Propylene Glycol (mg/l)	Ammonia- N (mg/l)	TKN (mg/l)
A21-012809-14:00	410	*	*	0.511	2.5
A21-012809-22:00	290	*	*	6.14	15
A21-012909-20:00	280	NA	NA	6.93	17
A21-013009-00:00	300	NA	NA	8.66	20
Range for Event	<80-410	*	*	0.511-9.21	2.5-23
A21-011109-12:00	<80	<100	<100	0.252	0.58
A21-011209-00:00	84	<100	<100	1.67	2
A21-011209-02:00	110	NA	NA	3.54	4.5
A21-011209-12:00	100	<100	<100	1.12	2
A21-011209-14:00	100	NA	NA	1.46	1.8
Range for Event	<20-850	<100	<100	0.25-18.1	0.58-18
A21-121908-18:00	260	NA	NA	0.844	<0.5
A21-122008-07:00	680	<5	<5	0.357	0.59
Range for Event	32-680	<5	<5	0.357-4.63	<0.5-4.2

* Indicates that data were not useable.

NA Indicates that sample was not analyzed for this parameter

Range for Event includes all samples collected within the stormwater system.

Table 3-6 *Arbacia punctulata* Fertilization Tests

Location	Date Sampled	Time	Test Species	NOEC Fertilization	COD (ppm)	Ethylene Glycol (ppm)	Propylene Glycol (ppm)	Ammonia (ppm)	Tolyltriazoles (ppb)	Nonylpheno (ppb)
001B - North	3/15/2008	**	Arbacia punctulata	<6.25%	4600	NA	NA	1.8	NA	NA
001B - North	3/2/2009	18:58	Arbacia punctulata	6.25%	1037	*	*	1.01	68	0.2ND
002B - West	3/15/2008	**	Arbacia punctulata	6.25%	1000	NA	NA	1.7	NA	NA
002B - West	3/19/2008	8:15	Arbacia punctulata	12.5%	480	43	59	5.8	NA	NA
001B - North	3/3/2009	7:58	Arbacia punctulata	50%	871	*	*	0.576	26.9	0.2ND
A21	3/3/2009	8:58	Arbacia punctulata	50%	77	*	*	7.41	12.2	0.21
001B - North	3/19/2008	7:35	Arbacia punctulata	100%	790	20	13	2.2	NA	NA

** Test started past holding time.

* Data for this parameter were not usable.

NA Sample was not analyzed for this parameter.

2008-2009 Toxicity test samples wee composites of four hourly samples

Table 3-7 *Mysidopsis bahia* Survival and Growth Tests

Location	Date Sampled	Time	Test Species	48LC50	CNOEC GROWTH	COD (ppm)	Ethylene Glycol (ppm)	Propylene Glycol (ppm)	Ammonia_N (ppm)	TKN (ppm)	Tolyltriazoles (ppb)	Nonylphenols (ppb)
001B - North Outfall	3/2/2009	18:58	Mysidopsis bahia	39.9%	25%	1037	*	*	1.01	3.6	68	0.2ND
001B - North Outfall	3/3/2009	7:58	Mysidopsis bahia	82.4%	50%	871	*	*	0.576	1.7	26.9	0.2ND
002B - West Outfall	12/19/2008	20:00	Mysidopsis bahia	100%	50%	776	10ND	46	0.85	1.0 ND	41.6	2.3
A21	3/3/2009	8:58	Mysidopsis bahia	>100%	100%	77	*	*	7.41	7.8	12.2	0.21

* Data for this parameter were not usable.

NA Sample was not analyzed for this parameter.

ND Not detected at noted level.

2008-2009 Toxicity test samples were composites of four hourly samples.

Table 3-8 *Menidia beryllina* Survival and Growth Tests

Location	Date Sampled	Time	Test Species	48LC50	CNOEC GROWTH	COD (ppm)	Ethylene Glycol (ppm)	Propylene Glycol (ppm)	Ammonia-N (ppm)	TKN (ppm)	Tolyltriazole (ppb)	Nonylphendi (ppb)
001B - North	3/2/2009	18:58	Menidia beryllina	16.0%	6.25%	1037	*	*	1.01	3.6	68	0.2ND
001B - North	3/3/2009	7:58	Menidia beryllina	36.0%	25%	871	*	*	0.576	1.7	26.9	0.2ND
001B - North	3/15/2008	**	Menidia beryllina	50%	25%	4600	NA	NA	1.8	2.8	NA	NA
A21	3/3/2009	8:58	Menidia beryllina	95.2%	25%	77	*	*	7.41	7.8	12.2	0.21
002B - West	12/19/2008	20:00	Menidia beryllina	100%	50%	776	10ND	46	0.85	1.0 ND	41.6	2.3
001B - North	3/19/2008		Menidia beryllina	>100%	100%	790	20	13	2.2	NA	NA	NA
002B - West	3/15/2008	**	Menidia beryllina	>100%	100%	1000	NA	NA	1.7	2.8	NA	NA
002B - West	3/19/2008		Menidia beryllina	>100%	100%	480	43	59	5.8	NA	NA	NA

** Test started past holding time.

* Data for this parameter were not usable.

NA Sample was not analyzed for this parameter.

ND Not detected at noted level.

2008-2009 Toxicity test samples were composites of four hourly samples

Table 3-9 Discharge Dilution Needed to Meet Support of Aquatic Life Criterion

Location	Date Sampled	Sample Limitations	Test Species	WET48LC50	WET48LC25	Dilution to meet 75% Survival Criterion
001B - North Outfall*	3/15/2008	Past holding time	Menidia beryllina	50%	37.50%	2.5
002B - West Outfall*	3/15/2008	Past holding time	Menidia beryllina	>100%	>100%	None
001B - North Outfall	3/19/2008	None	Menidia beryllina	>100%	>100%	None
002B - West Outfall	3/19/2008	None	Menidia beryllina	>100%	>100%	None
002B - West Outfall	12/19/2008	None	Menidia beryllina	100%	>100%	None
002B - West Outfall	12/19/2008	None	Mysidopsis bahia	100%	>100%	None
001B - North Outfall	3/2/2009	Not Representative*	Menidia beryllina	16.0%	12.50%	8
001B - North Outfall	3/2/2009	Not Representative*	Mysidopsis bahia	39.9%	33%	3
001B - North Outfall	3/3/2009	Not Representative*	Menidia beryllina	36.0%	29%	3.4
001B - North Outfall	3/3/2009	Not Representative*	Mysidopsis bahia	82.4%	82%	0.1
A21	3/3/2009	Not Representative*	Menidia beryllina	95.2%	60%	1.7
A21	3/3/2009	Not Representative*	Mysidopsis bahia	>100%	>100%	None

* Sample was not representative of discharge flow as described in Section 3.2.2

Table 4.2-1 Predicted Plume Dimensions for the 2, 5, 10, and 20 Dilution Contours at Outfall North,
11-13 January 2009 Event

Day	Hr	Area (1,000 sq-ft) for Dilution				Distance (ft) for Dilution			
		2	5	10	20	2	5	10	20
11	0	0.6	1.5	3.2	4.2	36	36	36	63
11	1	1.5	5.0	11.3	31.8	36	79	152	263
11	2	1.3	4.7	5.6	11.0	36	81	99	212
11	3	2.5	11.5	18.1	32.6	81	229	411	648
11	4	3.9	29.4	35.3	39.6	131	673	873	917
11	5	6.0	33.5	34.7	38.4	133	793	831	876
11	6	5.5	18.2	25.3	29.7	104	426	453	649
11	7	1.5	15.2	74.6	96.6	36	213	519	719
11	8	1.5	3.9	9.7	106.8	36	51	110	567
11	9	0.6	4.1	9.1	27.8	36	49	89	186
11	10	0.0	1.3	8.3	20.1	0	22	67	165
11	11	0.0	0.0	0.2	1.5	0	0	36	36
11	12	0.0	0.0	0.2	1.3	0	0	36	36
11	13	0.6	1.5	3.2	6.2	36	36	44	67
11	14	1.5	7.1	19.3	52.1	36	95	212	381
11	15	1.8	4.4	5.3	15.6	36	97	142	314
11	16	3.9	21.6	31.1	38.8	131	476	705	912
11	17	2.9	24.6	24.6	28.9	97	556	556	917
11	18	5.5	24.6	24.6	25.9	129	556	556	869
11	19	6.0	20.2	26.6	33.3	142	462	591	648
11	20	1.3	5.9	9.7	20.4	36	105	444	676
11	21	1.5	3.9	33.8	201.0	36	61	427	583
11	22	1.3	3.8	8.9	23.1	36	49	75	173
11	23	0.6	4.1	10.4	28.5	36	44	93	186
12	0	0.0	0.0	0.2	4.1	0	0	36	43
12	1	0.0	0.0	0.2	1.5	0	0	36	36
12	2	1.5	5.2	8.7	21.1	36	64	103	172
12	3	1.3	4.7	6.6	56.5	36	81	124	735
12	4	2.5	8.4	16.1	32.6	67	183	346	648
12	5	3.4	27.4	34.1	39.6	99	628	827	917
12	6	2.5	32.9	34.1	35.3	81	789	831	873
12	7	4.6	16.5	22.0	26.9	99	363	507	596
12	8	1.5	5.4	21.0	36.9	36	88	469	690
12	9	1.5	3.9	9.7	151.4	36	51	122	549
12	10	1.1	4.1	9.1	25.2	36	49	78	186
12	11	0.0	1.3	7.3	28.1	0	22	78	206
12	12	0.0	0.0	0.2	1.5	0	0	36	36
12	13	0.0	0.0	0.2	1.5	0	0	36	36
12	14	0.6	3.2	5.7	10.7	36	44	74	105
12	15	1.5	5.4	19.0	61.1	36	95	255	568

Table 4.2-1 Predicted Plume Dimensions at Outfall North, 11-13 January 2009 (Continued)

Day	Hr	Area (1,000 sq-ft) for Dilution				Distance (ft) for Dilution			
		2	5	10	20	2	5	10	20
12	16	1.6	4.6	10.1	21.3	45	116	201	468
12	17	3.4	26.3	35.3	39.6	99	618	869	936
12	18	2.5	24.6	24.6	26.2	81	556	556	912
12	19	4.2	24.6	24.6	24.6	99	556	556	556
12	20	5.5	22.2	34.5	41.3	131	504	660	715
12	21	1.3	4.1	9.0	19.3	36	105	444	676
12	22	1.5	3.9	27.7	164.5	36	61	427	555
12	23	1.3	3.8	8.9	26.3	36	49	75	214
13	0	1.1	4.1	11.6	31.8	36	49	98	214
13	1	0.0	0.0	0.2	5.7	0	0	36	67
13	2	0.6	1.5	3.2	6.5	36	36	44	81
13	3	1.5	5.9	16.9	50.7	36	92	183	346
13	4	1.8	3.9	6.2	23.2	36	95	142	379
13	5	4.2	16.1	25.9	48.0	116	363	583	873
13	6	2.9	26.7	26.7	32.5	97	628	628	941
13	7	3.4	29.2	30.3	31.6	99	789	827	869
13	8	5.0	18.9	24.1	30.7	104	418	564	625
13	9	1.5	5.4	19.8	38.8	36	79	460	693

Table 4.2-2 Predicted Plume Dimensions for the 2, 5, 10, and 20 Dilution Contours at Outfall North,
28-30 January 2009 Event

Day	Hr	Area (1,000 sq-ft) for Dilution				Distance (ft) for Dilution			
		2	5	10	20	2	5	10	20
28	1	0.0	0.0	0.2	0.6	0	0	36	36
28	2	0.0	0.0	0.2	1.5	0	0	36	36
28	3	0.0	0.0	0.2	1.5	0	0	36	36
28	4	1.8	3.9	6.6	12.9	36	95	142	229
28	5	0.0	12.6	18.9	30.7	0	263	418	625
28	6	0.0	12.6	32.7	38.4	0	545	793	876
28	7	0.0	0.0	29.7	45.2	0	0	705	796
28	8	0.0	0.0	19.1	31.6	0	0	426	484
28	9	0.0	0.0	4.5	59.8	0	0	64	519
28	10	0.0	0.0	0.2	1.5	0	0	36	36
28	11	0.0	0.0	0.2	1.3	0	0	36	36
28	12	0.0	0.0	0.2	0.9	0	0	36	36
28	13	0.0	0.0	0.2	1.3	0	0	36	36
28	14	0.0	0.0	0.2	1.3	0	0	36	36
28	15	0.0	0.0	0.2	1.5	0	0	36	36
28	16	8.0	16.4	29.9	52.4	126	212	314	462
28	17	17.9	64.2	105.1	129.4	284	752	941	1026
28	18	49.6	63.9	80.4	98.1	793	941	1015	1071
28	19	58.1	74.1	85.1	112.5	876	977	1028	1085
28	20	79.8	95.9	113.0	141.9	876	965	1026	1073
28	21	116.2	139.2	155.5	187.0	700	802	894	997
28	22	348.5	553.5	695.8	806.2	588	835	926	926
28	23	6.6	329.8	568.8	777.6	454	710	830	920
29	0	0.0	11.4	339.7	710.4	0	454	880	1096
29	1	0.0	0.0	94.9	582.7	0	0	713	1201
29	2	0.0	0.0	0.2	556.5	0	0	36	1201
29	3	0.0	0.0	0.2	651.9	0	0	36	1143
29	4	4.1	9.3	26.5	163.5	64	152	363	936
29	5	6.5	20.1	63.0	91.9	147	444	876	1015
29	6	22.9	35.9	47.7	61.0	504	873	965	1028
29	7	31.1	34.7	38.8	53.3	705	831	912	1008
29	8	21.6	36.7	43.7	50.9	484	660	738	819
29	9	0.0	18.6	28.2	36.2	0	429	689	689
29	10	0.0	57.8	122.6	175.2	0	519	743	919
29	11	0.0	0.0	10.8	218.5	0	0	483	1004
29	12	0.0	0.0	0.2	1.5	0	0	36	36
29	13	0.0	0.0	0.2	1.5	0	0	36	36
29	14	0.0	0.0	0.2	1.5	0	0	36	36
29	15	0.0	0.0	0.2	1.5	0	0	36	36
29	16	3.2	5.8	11.4	22.4	36	92	157	226

Table 4.2-2 Predicted Plume Dimensions at Outfall North, 28-30 January 2009 (Continued)

Day	Hr	Area (1,000 sq-ft) for Dilution				Distance (ft) for Dilution			
		2	5	10	20	2	5	10	20
29	17	3.9	8.1	26.4	93.9	81	171	381	912
29	18	12.6	25.9	53.3	68.8	263	583	836	965
29	19	24.6	35.3	39.6	51.3	583	873	936	977
29	20	2.5	33.5	34.7	44.2	79	793	831	926
29	21	0.0	20.2	24.1	31.6	0	453	545	638
29	22	0.0	5.5	19.8	37.3	0	133	444	676
29	23	0.0	0.0	10.8	205.9	0	0	319	611
30	0	0.0	0.0	0.2	1.5	0	0	36	36
30	1	0.0	0.0	0.2	1.5	0	0	36	36
30	2	0.0	0.0	0.2	1.5	0	0	36	36
30	3	0.0	0.0	0.2	1.5	0	0	36	36
30	4	0.0	0.0	0.2	1.5	0	0	36	36
30	5	1.6	4.7	6.6	11.3	36	81	124	189
30	6	3.0	12.1	18.7	37.8	81	229	414	664
30	7	8.5	24.1	44.9	57.0	207	539	748	876
30	8	0.0	35.5	49.7	55.8	0	660	796	873
30	9	0.0	25.1	36.6	54.4	0	426	548	689
30	10	0.0	18.2	55.5	78.9	0	192	469	690
30	11	0.0	0.0	44.1	280.7	0	0	455	594

Table 4.2-3 Predicted Plume Dimensions for the 2, 5, 10, and 20 Dilution Contour at Outfall North,
1-3 March 2009 Event

Day	Hr	Area (1,000 sq-ft) for Dilution				Distance (ft) for Dilution			
		2	5	10	20	2	5	10	20
1	18	0.0	0.0	0.2	1.6	0	0	36	36
1	19	0.0	0.0	0.0	2.7	0	0	0	81
1	20	0.0	0.0	0.0	3.4	0	0	0	99
1	21	0.0	0.0	0.2	0.9	0	0	36	36
1	22	0.0	0.0	0.2	1.3	0	0	36	36
1	23	0.0	0.0	0.2	1.5	0	0	36	36
2	0	0.0	0.0	0.2	1.5	0	0	36	36
2	1	0.0	0.0	0.2	1.3	0	0	36	36
2	2	0.0	0.0	0.2	0.6	0	0	36	36
2	3	0.0	0.0	0.2	1.3	0	0	36	36
2	4	0.0	0.0	0.2	1.3	0	0	36	36
2	5	0.0	0.0	0.2	1.5	0	0	36	36
2	6	6.3	12.8	31.1	58.6	97	226	411	609
2	7	0.0	6.0	46.1	76.7	0	147	780	965
2	8	0.0	0.0	48.4	62.2	0	0	873	965
2	9	0.0	0.0	36.0	50.0	0	0	796	873
2	10	0.0	0.0	11.5	25.3	0	0	410	564
2	11	0.0	0.0	0.2	34.7	0	0	36	444
2	12	0.0	0.0	0.2	58.5	0	0	36	382
2	13	0.0	0.0	0.2	1.5	0	0	36	36
2	14	0.0	0.0	0.2	1.5	0	0	36	36
2	15	0.0	0.0	0.2	1.3	0	0	36	36
2	16	0.0	0.0	0.2	1.5	0	0	36	36
2	17	0.6	1.5	3.2	5.7	36	36	44	67
2	18	6.2	21.0	43.6	75.6	95	226	411	578
2	19	0.0	6.4	73.1	100.5	0	142	873	1006
2	20	0.0	0.0	53.0	69.8	0	0	863	977
2	21	0.0	0.0	28.2	48.8	0	0	785	876
2	22	0.0	0.0	15.3	39.2	0	0	625	717
2	23	0.0	0.0	0.2	35.7	0	0	36	444
3	0	0.0	0.0	0.2	72.5	0	0	36	382
3	1	0.0	0.0	0.2	1.5	0	0	36	36
3	2	0.0	0.0	0.2	1.3	0	0	36	36
3	3	0.0	0.0	0.2	1.3	0	0	36	36
3	4	0.0	0.0	0.2	1.3	0	0	36	36
3	5	0.0	0.0	0.2	1.5	0	0	36	36
3	6	0.0	0.0	0.2	1.5	0	0	36	36
3	7	0.0	0.0	0.2	1.8	0	0	36	36
3	8	0.0	0.0	0.0	2.5	0	0	0	81
3	9	0.0	0.0	0.0	1.9	0	0	0	64
3	10	0.0	0.0	0.0	0.4	0	0	0	5
3	11	0.0	0.0	0.0	0.0	0	0	0	0
3	12	0.0	0.0	0.2	1.1	0	0	36	36

Table 4.2-4 Predicted Plume Dimensions for the 2, 5, 10, and 20 Dilution Contours at Outfall A21,
11-12 January 2009 Event

Day	Hr	Area (1,000 sq-ft) for Dilution				Distance (ft) for Dilution			
		2	5	10	20	2	5	10	20
11	0	0.8	1.3	2.3	3.1	24	26	73	107
11	1	4.5	7.3	9.1	10.3	159	279	340	376
11	2	10.4	15.7	18.9	24.5	480	675	754	827
11	3	26.3	40.5	44.8	47.9	929	1055	1128	1203
11	4	38.4	50.9	78.9	96.2	1038	1277	1711	1795
11	5	28.9	50.9	84.6	128.3	938	1277	1697	1809
11	6	27.1	96.4	200.4	306.5	895	1252	1362	1506
11	7	12.9	29.5	63.9	166.2	677	833	1051	1346
11	8	2.8	6.8	32.6	71.1	87	556	715	1026
11	9	3.4	12.1	25.4	45.5	53	143	225	383
11	10	0.0	7.2	14.9	25.6	0	105	165	225
11	11	0.0	0.0	8.7	26.7	0	0	116	225
11	12	0.0	0.0	0.3	30.6	0	0	27	242
11	13	0.8	1.3	2.8	17.9	24	26	87	375
11	14	7.3	10.9	16.4	27.1	279	393	488	674
11	15	18.0	26.9	38.9	58.1	741	891	999	1118
11	16	44.8	50.3	73.2	119.8	1128	1240	1717	1857
11	17	41.2	81.5	98.5	122.3	1055	1762	1846	2119
11	18	31.7	83.2	122.9	149.4	938	1752	1894	2012
11	19	31.7	83.5	154.2	222.0	938	1473	1619	1751
11	20	31.2	96.3	225.9	335.9	895	1107	1305	1522
11	21	6.8	26.1	54.7	116.7	256	697	1042	1121
11	22	1.8	8.0	24.2	66.9	49	157	617	965
11	23	2.2	9.4	17.4	28.6	42	118	175	237
12	0	0.0	0.0	18.4	35.4	0	0	179	267
12	1	0.0	0.0	7.9	26.4	0	0	183	375
12	2	2.8	5.1	8.5	25.2	87	183	321	532
12	3	9.8	15.4	19.9	33.0	458	670	758	886
12	4	29.7	41.2	64.7	109.5	938	1055	1298	1463
12	5	44.8	60.5	89.6	126.0	1128	1569	1762	1878
12	6	30.4	58.6	95.9	179.0	938	1569	1781	1982
12	7	29.2	101.6	211.7	308.7	938	1378	1497	1635
12	8	18.6	43.3	104.7	272.1	805	895	1065	1454
12	9	3.7	10.7	35.2	76.2	129	673	1005	1042
12	10	2.8	9.9	23.6	58.6	53	143	249	580
12	11	0.0	7.2	15.0	25.6	0	105	165	225
12	12	0.0	0.0	9.7	29.2	0	0	119	237
12	13	0.0	0.0	0.3	35.4	0	0	27	267
12	14	1.3	2.8	4.5	17.3	26	87	159	400
12	15	9.1	13.2	16.7	24.6	340	480	606	746

Table 4.2-4 Predicted Plume Dimensions at Outfall A21, 11-12 January (Continued)

Day	Hr	Area (1,000 sq-ft) for Dilution				Distance (ft) for Dilution			
		2	5	10	20	2	5	10	20
12	16	22.3	29.8	35.7	44.4	840	938	1037	1205
12	17	45.5	55.4	85.2	123.8	1165	1535	1762	1927
12	18	37.8	81.5	100.1	106.1	1055	1762	1894	2119
12	19	29.8	81.8	121.1	131.9	938	1731	1947	2029
12	20	29.8	82.5	142.0	204.3	938	1528	1662	1804
12	21	32.6	118.7	240.6	364.1	895	1107	1305	1566
12	22	7.3	20.9	40.3	90.0	279	697	743	1033
12	23	1.8	5.1	15.9	52.9	49	147	865	1022
13	0	3.4	12.4	22.7	38.0	53	143	206	290
13	1	0.0	0.0	18.4	30.1	0	0	207	309
13	2	0.8	1.8	9.4	18.8	24	49	286	408
13	3	5.6	9.1	14.1	25.7	207	340	451	648
13	4	13.8	21.4	30.2	40.9	606	797	895	983
13	5	33.6	47.3	49.3	77.1	985	1165	1240	1628
13	6	37.8	56.6	85.2	118.9	1055	1535	1762	1927
13	7	28.9	53.0	85.2	145.6	938	1492	1762	1964
13	8	27.4	92.5	184.8	269.8	919	1391	1529	1651
13	9	20.5	45.3	114.9	267.1	805	895	1092	1454
13	10	3.1	7.3	29.8	65.0	107	595	697	1042
13	11	2.6	9.4	21.8	51.5	53	143	229	580
13	12	0.0	8.7	16.9	27.6	0	118	166	237
13	13	0.0	0.0	11.6	30.6	0	0	138	242
13	14	0.0	0.0	0.3	30.2	0	0	24	290
13	15	1.3	2.8	4.8	17.3	26	87	179	436
13	16	7.5	11.6	15.0	25.0	376	523	649	788
13	17	25.1	36.4	41.2	47.4	894	1037	1055	1351
13	18	44.8	57.2	87.7	119.5	1128	1540	1762	1878
13	19	33.5	64.5	90.3	134.7	1037	1703	1806	2071
13	20	29.2	71.4	89.7	144.2	938	1617	1752	1894
13	21	28.8	112.2	225.2	312.8	938	1317	1445	1620

Table 4.2-5 Predicted Plume Dimensions for the 2, 5, 10, and 20 Dilution Contours at Outfall A21, 28-30 January 2009 Event

Day	Hr	Area (1,000 sq-ft) for Dilution				Distance (ft) for Dilution			
		2	5	10	20	2	5	10	20
28	1	0.0	0.0	0.3	1.3	0	0	24	26
28	2	1.3	2.3	3.4	4.5	26	73	109	159
28	3	4.5	7.9	9.7	11.5	159	300	359	412
28	4	10.4	16.5	20.4	25.7	480	710	788	853
28	5	20.0	38.4	43.2	47.3	788	1038	1090	1165
28	6	14.7	47.3	51.8	77.9	648	1165	1277	1668
28	7	14.4	40.5	51.8	96.0	625	1055	1277	1569
28	8	13.3	33.9	79.9	172.5	585	973	1157	1256
28	9	7.5	11.6	24.4	45.8	376	523	805	878
28	10	0.0	2.6	6.8	17.1	0	109	256	697
28	11	0.8	1.3	4.5	11.3	24	26	108	239
28	12	2.2	8.8	14.1	22.7	42	118	152	206
28	13	0.0	0.0	16.9	31.4	0	0	167	243
28	14	0.0	0.0	3.4	19.3	0	0	100	309
28	15	2.3	4.5	7.0	14.3	73	159	271	419
28	16	9.1	13.8	17.3	24.1	340	502	625	745
28	17	17.4	27.5	35.4	50.9	731	891	951	1036
28	18	31.7	44.2	47.9	76.1	938	1090	1203	1450
28	19	31.7	50.3	103.5	180.2	938	1240	1528	1681
28	20	27.6	61.0	140.4	302.5	866	1126	1256	1410
28	21	25.5	33.4	48.4	159.9	805	860	907	1184
28	22	25.9	38.5	55.4	95.6	697	734	860	1014
28	23	20.4	33.0	55.4	70.8	448	513	722	743
29	0	20.3	36.8	53.2	82.0	341	454	524	705
29	1	12.5	26.5	40.3	57.8	249	387	481	608
29	2	14.7	31.2	44.1	62.9	367	502	601	700
29	3	25.0	40.2	64.2	91.9	564	740	831	915
29	4	26.6	47.0	67.2	111.8	806	938	1019	1142
29	5	42.9	119.1	187.6	264.4	1118	1381	1584	1729
29	6	52.1	99.1	164.8	259.3	1240	1811	1950	2104
29	7	72.9	101.1	186.5	266.3	1540	1781	1947	2067
29	8	110.7	199.2	309.1	438.2	1537	1691	1804	1947
29	9	153.7	296.2	396.6	553.7	1254	1513	1671	1878
29	10	67.1	265.5	422.5	553.2	891	1439	1636	1747
29	11	23.7	61.8	160.2	458.7	499	759	1046	1713
29	12	17.7	37.8	83.9	150.7	345	466	782	876
29	13	13.4	30.9	54.3	108.0	252	408	566	776
29	14	11.8	30.9	50.9	104.2	308	466	599	768
29	15	11.5	32.8	51.8	78.9	392	608	719	838
29	16	19.2	46.1	67.7	105.9	677	854	938	1062

Table 4.2-5 Predicted Plume Dimensions at Outfall A21, 28-30 January 2009 (Continued)

Day	Hr	Area (1,000 sq-ft) for Dilution				Distance (ft) for Dilution			
		2	5	10	20	2	5	10	20
29	17	36.1	67.5	122.7	201.9	938	1100	1256	1463
29	18	49.2	84.7	168.0	278.4	1165	1608	1781	1950
29	19	55.2	106.8	174.3	256.4	1315	1811	1982	2119
29	20	73.6	109.7	198.1	284.2	1569	1740	1947	2052
29	21	124.0	214.7	298.9	462.3	1424	1584	1714	1887
29	22	96.4	289.0	403.3	564.9	1065	1477	1637	1892
29	23	30.6	75.5	253.8	442.7	734	882	1522	1727
30	0	15.0	39.6	68.4	245.8	424	697	759	1172
30	1	12.0	27.2	44.2	103.8	286	454	705	847
30	2	8.8	20.5	38.2	74.0	231	392	513	732
30	3	7.3	23.4	41.8	69.8	279	457	599	719
30	4	12.3	27.4	48.7	72.9	419	667	785	900
30	5	19.0	38.4	58.0	101.0	754	921	1019	1142
30	6	31.7	50.9	104.4	190.3	938	1205	1410	1624
30	7	46.4	77.0	147.9	243.3	1165	1578	1742	1878
30	8	50.3	110.2	218.1	360.1	1240	1583	1752	1899
30	9	70.6	204.4	357.3	527.3	1124	1275	1469	1625
30	10	27.2	60.6	248.4	421.6	836	915	1373	1576
30	11	17.3	35.5	87.4	296.2	466	743	1018	1343
30	12	8.2	22.2	57.5	116.9	248	443	825	912
30	13	10.7	29.6	51.1	103.1	152	318	431	665
30	14	0.0	25.5	45.1	77.7	0	243	369	503
30	15	2.3	11.5	23.5	46.3	73	292	425	570
30	16	7.3	17.6	32.4	61.7	279	457	630	781
30	17	12.1	22.4	38.8	62.6	544	772	895	1000
30	18	27.9	37.2	71.2	131.8	929	1037	1224	1422
30	19	44.8	56.5	117.4	193.2	1128	1503	1717	1857
30	20	47.3	79.4	123.0	213.1	1165	1681	1811	2004
30	21	47.9	94.4	174.7	328.6	1203	1487	1628	1840

Table 4.2-6 Predicted Plume Dimensions for the 2, 5, 10, and 20 Dilution Contours at Outfall A21,
1-3 March 2009 Event

Day	Hr	Area (1,000 sq-ft) for Dilution				Distance (ft) for Dilution			
		2	5	10	20	2	5	10	20
1	2	0.0	0.0	0.3	1.7	0	0	24	32
1	3	0.0	0.0	0.3	2.1	0	0	24	73
1	4	2.8	5.4	6.8	8.2	87	203	256	313
1	5	6.8	11.3	13.8	16.0	359	516	606	693
1	6	20.9	29.8	33.0	40.5	815	938	953	1055
1	7	37.3	50.3	64.3	96.6	1038	1240	1578	1720
1	8	29.2	50.9	77.3	101.5	938	1277	1690	1781
1	9	26.5	52.4	109.5	177.4	895	1370	1508	1620
1	10	24.3	54.5	111.2	232.6	842	1039	1126	1393
1	11	11.5	17.9	37.6	82.5	412	718	847	1017
1	12	2.3	5.6	14.1	42.4	73	207	653	982
1	13	1.8	6.1	10.5	19.3	49	137	215	318
1	14	0.0	9.8	20.9	32.5	0	143	206	290
1	15	0.0	0.0	10.5	20.8	0	0	203	318
1	16	1.3	2.8	6.8	16.3	26	87	256	424
1	17	6.2	10.3	16.4	26.7	231	376	499	655
1	18	12.1	18.6	26.4	37.5	544	746	853	938
1	19	27.6	41.2	48.7	86.2	937	1055	1255	1410
1	20	33.6	49.3	71.6	135.6	985	1240	1503	1690
1	21	26.5	47.3	120.4	254.0	895	1165	1412	1588
1	22	18.1	30.7	72.6	243.2	785	895	1085	1341
1	23	9.1	17.4	31.5	81.3	340	678	734	882
2	0	2.3	5.4	13.8	48.0	73	203	542	722
2	1	2.3	9.6	19.5	35.7	65	140	229	354
2	2	0.0	8.5	20.2	33.1	0	119	190	267
2	3	0.0	0.0	18.1	40.9	0	0	179	321
2	4	0.0	0.0	3.7	19.5	0	0	129	376
2	5	3.7	6.5	10.6	26.0	129	249	359	552
2	6	8.7	14.4	19.8	33.9	412	625	751	869
2	7	21.8	29.8	34.8	50.1	827	938	1037	1164
2	8	39.7	50.3	68.1	119.6	1054	1240	1588	1740
2	9	29.8	51.8	108.1	187.6	938	1277	1631	1749
2	10	24.2	42.6	101.6	206.3	853	1055	1252	1427
2	11	16.8	32.4	69.5	246.2	718	895	1065	1373
2	12	8.5	15.8	23.5	63.3	321	678	718	847
2	13	1.8	4.0	7.0	23.2	49	133	271	722
2	14	2.5	7.4	13.5	24.5	78	167	252	357
2	15	0.0	8.8	17.6	25.5	0	166	242	326
2	16	0.0	0.0	10.6	17.4	0	0	286	375
2	17	4.0	7.3	12.2	24.9	133	279	404	572

Table 4.2-6 Predicted Plume Dimensions at Outfall A21, 1-3 March 2009 (Continued)

Day	Hr	Area (1,000 sq-ft) for Dilution				Distance (ft) for Dilution			
		2	5	10	20	2	5	10	20
2	18	9.1	15.0	19.6	34.1	340	544	684	805
2	19	17.1	26.8	34.2	51.8	722	895	965	1078
2	20	33.6	47.9	51.7	92.3	985	1203	1432	1632
2	21	29.8	50.9	90.9	142.9	938	1277	1621	1752
2	22	26.0	48.7	132.7	242.3	895	1203	1431	1572
2	23	19.8	33.4	79.2	239.6	805	895	1085	1386
3	0	8.5	15.7	26.9	66.5	321	678	734	863
3	1	1.8	5.1	13.6	49.2	49	183	555	907
3	2	1.8	5.7	10.5	19.7	49	133	215	326
3	3	0.0	12.7	25.9	40.4	0	143	225	321
3	4	0.0	0.0	13.2	26.3	0	0	190	309
3	5	1.3	3.1	7.0	20.3	26	107	271	445
3	6	6.2	9.7	15.9	26.7	231	359	480	655
3	7	13.3	20.4	28.6	39.7	585	788	886	967
3	8	31.0	43.2	50.4	85.1	938	1090	1332	1482
3	9	33.6	50.9	86.5	118.6	985	1277	1697	1795
3	10	26.5	50.3	90.7	139.2	895	1240	1662	1785
3	11	25.0	47.3	110.8	201.7	877	1165	1378	1520
3	12	21.0	31.0	62.9	207.3	805	915	1062	1393

Table 4.2-7 Predicted Plume Dimensions for the 2, 5, 10, and 20 Dilution Contours at West Outfall,
19-21 December 2008 Event

Date-Time	Plume Area (1,000 sq-ft)				Plume Length (ft)			
	2	5	10	20	2	5	10	20
12/19/08 12:00	0.0	0.0	0.0	3.1	0	0	0	16
12/19/08 14:00	0.0	0.0	0.0	0.0	0	0	0	0
12/19/08 16:00	0.0	0.0	0.0	0.0	0	0	0	0
12/19/08 18:00	0.0	0.0	0.0	0.0	0	0	0	0
12/19/08 20:00	0.0	0.0	0.0	0.0	0	0	0	0
12/19/08 21:00	0.0	0.0	0.0	0.0	0	0	0	0
12/19/08 22:00	0.0	0.0	0.0	0.0	0	0	0	0
12/19/08 22:30	4.5	53.4	121.9	208.8	67	512	903	1165
12/19/08 23:00	5.2	95.2	246.0	461.6	72	905	1469	1799
12/19/08 23:30	3.3	35.2	192.6	622.0	57	683	1799	2453
12/20/08 0:00	0.0	3.7	72.0	382.9	0	16	1469	2783
12/20/08 0:30	0.0	0.0	0.0	118.6	0	0	0	2781
12/20/08 1:00	0.0	0.0	0.0	0.0	0	0	0	0
12/20/08 2:00	0.0	0.0	0.0	0.0	0	0	0	0
12/20/08 3:00	0.0	0.0	0.0	0.0	0	0	0	0
12/20/08 4:00	0.0	0.0	0.0	0.0	0	0	0	0
12/20/08 5:00	0.0	0.0	0.0	0.0	0	0	0	0
12/20/08 6:00	0.0	0.0	0.0	0.0	0	0	0	0
12/20/08 7:00	0.0	0.0	0.0	0.0	0	0	0	0
12/20/08 8:00	0.0	0.0	0.0	0.0	0	0	0	0
12/20/08 9:00	0.0	0.0	0.0	0.0	0	0	0	0
12/20/08 9:30	0.0	0.0	0.0	0.0	0	0	0	0
12/20/08 10:00	5.2	67.3	148.9	251.6	72	683	905	1167
12/20/08 10:30	6.6	124.5	396.6	632.4	81	1165	1797	2127
12/20/08 11:00	5.8	98.8	314.9	948.2	76	686	2125	2783
12/20/08 11:30	5.8	48.0	270.0	876.4	76	512	1797	2453
12/20/08 12:00	4.2	48.7	194.6	954.4	65	512	1165	2781
12/20/08 12:30	0.0	7.1	91.2	602.3	0	53	905	2453
12/20/08 13:00	0.0	0.0	0.0	124.8	0	0	0	2781
12/20/08 13:30	0.0	0.0	0.0	0.0	0	0	0	0
12/20/08 14:00	0.0	0.0	0.0	0.0	0	0	0	0
12/20/08 15:00	0.0	0.0	0.0	0.0	0	0	0	0
12/20/08 16:00	0.0	0.0	0.0	0.0	0	0	0	0
12/20/08 17:00	0.0	0.0	0.0	0.0	0	0	0	0
12/20/08 18:00	0.0	0.0	0.0	0.0	0	0	0	0
12/20/08 19:00	0.0	0.0	0.0	0.0	0	0	0	0
12/20/08 20:00	0.0	0.0	0.0	0.0	0	0	0	0
12/20/08 21:00	0.0	0.0	0.0	0.0	0	0	0	0
12/20/08 22:00	0.0	0.0	0.0	0.0	0	0	0	0
12/20/08 22:30	0.0	0.0	0.0	0.0	0	0	0	0

Table 4.2-7 Predicted Plume Dimensions at West Outfall, 19-21 December 2008 (Continued)

Date-Time	Plume Area (1,000 sq-ft)				Plume Length (ft)			
	2	5	10	20	2	5	10	20
12/20/08 23:00	4.3	21.4	56.2	96.8	66	284	512	683
12/20/08 23:30	4.5	92.8	239.5	438.1	67	903	1165	1469
12/21/08 0:00	3.7	46.6	223.4	577.7	60	512	1797	2127
12/21/08 0:30	0.0	7.3	134.7	493.3	0	102	1469	2781
12/21/08 1:00	0.0	0.0	0.0	174.9	0	0	0	2455
12/21/08 1:30	0.0	0.0	0.0	0.0	0	0	0	0
12/21/08 2:00	0.0	0.0	0.0	0.0	0	0	0	0
12/21/08 3:00	0.0	0.0	0.0	0.0	0	0	0	0
12/21/08 4:00	0.0	0.0	0.0	0.0	0	0	0	0
12/21/08 5:00	0.0	0.0	0.0	0.0	0	0	0	0
12/21/08 6:00	0.0	0.0	0.0	0.0	0	0	0	0
12/21/08 7:00	0.0	0.0	0.0	0.0	0	0	0	0
12/21/08 8:00	0.0	0.0	0.0	0.0	0	0	0	0
12/21/08 9:00	0.0	0.0	0.0	0.0	0	0	0	0
12/21/08 10:00	0.0	0.0	0.0	0.0	0	0	0	0
12/21/08 11:00	0.0	0.0	0.0	0.0	0	0	0	0
12/21/08 11:30	0.0	0.0	0.0	0.0	0	0	0	0
12/21/08 12:00	5.7	66.2	162.2	234.8	76	512	903	905
12/21/08 12:30	6.3	91.2	262.6	561.5	79	686	1165	1799
12/21/08 13:00	5.4	61.1	280.4	842.6	73	512	1797	2127
12/21/08 13:30	0.0	8.1	121.1	625.5	0	102	1165	2781
12/21/08 14:00	0.0	0.0	0.0	162.0	0	0	0	2127
12/21/08 14:30	0.0	0.0	0.0	0.0	0	0	0	0
12/21/08 15:00	0.0	0.0	0.0	0.0	0	0	0	0
12/21/08 16:00	0.0	0.0	0.0	0.0	0	0	0	0
12/21/08 17:00	0.0	0.0	0.0	0.0	0	0	0	0
12/21/08 18:00	0.0	0.0	0.0	0.0	0	0	0	0
12/21/08 19:00	0.0	0.0	0.0	0.0	0	0	0	0
12/21/08 20:00	0.0	0.0	0.0	0.0	0	0	0	0
12/21/08 21:00	0.0	0.0	0.0	0.0	0	0	0	0

Table 4.2-8 Predicted Plume Dimensions for the 2, 5, 10, and 20 Dilution Contours at West Outfall, 11-12 January 2009 Event

Date-Time	Plume Area (1,000 sq-ft)				Plume Length (ft)			
	2	5	10	20	2	5	10	20
1/11/09 2:00	0.0	0.0	0.0	0.0	0	0	0	0
1/11/09 3:00	0.0	0.0	0.0	0.0	0	0	0	0
1/11/09 4:00	0.0	0.0	0.0	0.0	0	0	0	0
1/11/09 5:00	0.0	0.0	0.0	0.0	0	0	0	0
1/11/09 5:30	5.3	52.9	123.6	219.2	73	683	903	1167
1/11/09 6:00	5.8	85.4	239.6	464.1	76	686	1469	2125
1/11/09 6:30	4.3	49.0	212.3	594.2	65	903	1797	2127
1/11/09 7:00	0.0	3.5	65.9	478.2	0	16	903	2781
1/11/09 7:30	0.0	0.0	0.0	158.9	0	0	0	2783
1/11/09 8:00	0.0	0.0	0.0	0.0	0	0	0	0
1/11/09 9:00	0.0	0.0	0.0	0.0	0	0	0	0
1/11/09 10:00	0.0	0.0	0.0	0.0	0	0	0	0
1/11/09 11:00	0.0	0.0	0.0	0.0	0	0	0	0
1/11/09 12:00	0.0	0.0	0.0	0.0	0	0	0	0
1/11/09 13:00	0.0	0.0	0.0	0.0	0	0	0	0
1/11/09 14:00	0.0	0.0	0.0	0.0	0	0	0	0
1/11/09 15:00	0.0	0.0	0.0	0.0	0	0	0	0
1/11/09 16:00	0.0	0.0	0.0	0.0	0	0	0	0
1/11/09 16:30	0.0	0.0	0.0	0.0	0	0	0	0
1/11/09 17:00	8.2	60.3	133.1	243.5	90	517	903	1165
1/11/09 17:30	14.9	76.0	273.3	667.8	152	683	1469	2125
1/11/09 18:00	9.5	60.9	280.0	891.2	102	683	1496	2472
1/11/09 18:30	5.8	45.9	140.2	885.5	76	683	1165	2528
1/11/09 19:00	6.3	44.8	125.9	593.0	79	512	1165	2125
1/11/09 19:30	0.0	13.5	69.9	317.7	0	382	903	2453
1/11/09 20:00	0.0	0.0	0.0	26.4	0	0	0	2455
1/11/09 20:30	0.0	0.0	0.0	0.0	0	0	0	0
1/11/09 21:00	0.0	0.0	0.0	0.0	0	0	0	0
1/11/09 22:00	0.0	0.0	0.0	0.0	0	0	0	0
1/11/09 23:00	0.0	0.0	0.0	0.0	0	0	0	0
1/12/09 0:00	0.0	0.0	0.0	0.0	0	0	0	0
1/12/09 1:00	0.0	0.0	0.0	0.0	0	0	0	0
1/12/09 2:00	0.0	0.0	0.0	0.0	0	0	0	0
1/12/09 3:00	0.0	0.0	0.0	0.0	0	0	0	0
1/12/09 4:00	0.0	0.0	0.0	0.0	0	0	0	0

Table 4.2-8 Predicted Plume Dimensions at West Outfall, 11-12 January 2009 (Continued)

Date-Time	Plume Area (1,000 sq-ft)				Plume Length (ft)			
	2	5	10	20	2	5	10	20
1/12/09 5:00	0.0	0.0	0.0	0.0	0	0	0	0
1/12/09 5:30	0.0	0.0	0.0	0.0	0	0	0	0
1/12/09 6:00	4.9	22.1	47.7	83.3	70	284	512	686
1/12/09 6:30	9.4	62.7	156.7	379.4	102	683	1165	1797
1/12/09 7:00	5.5	38.3	140.6	524.5	74	512	1469	1820
1/12/09 7:30	0.0	5.7	75.7	414.6	0	52	905	2169
1/12/09 8:00	0.0	0.0	0.0	0.0	0	0	0	0
1/12/09 8:30	0.0	0.0	0.0	0.0	0	0	0	0
1/12/09 10:00	0.0	0.0	0.0	0.0	0	0	0	0
1/12/09 11:00	0.0	0.0	0.0	0.0	0	0	0	0
1/12/09 12:00	0.0	0.0	0.0	0.0	0	0	0	0
1/12/09 13:00	0.0	0.0	0.0	0.0	0	0	0	0
1/12/09 14:00	0.0	0.0	0.0	0.0	0	0	0	0
1/12/09 15:00	0.0	0.0	0.0	0.0	0	0	0	0
1/12/09 16:00	0.0	0.0	0.0	0.0	0	0	0	0
1/12/09 17:00	0.0	0.0	0.0	0.0	0	0	0	0
1/12/09 18:00	0.0	0.0	0.0	0.0	0	0	0	0
1/12/09 18:30	0.0	0.0	0.0	0.0	0	0	0	0
1/12/09 19:00	6.6	58.1	140.4	226.2	81	382	903	1165
1/12/09 19:30	5.7	85.6	268.8	517.9	75	903	1471	2127
1/12/09 20:00	5.4	71.4	311.3	661.4	73	903	2125	2453
1/12/09 20:30	0.0	13.1	150.5	673.8	0	102	1474	2145
1/12/09 21:00	0.0	0.0	0.0	61.8	0	0	0	1847
1/12/09 21:30	0.0	0.0	0.0	0.0	0	0	0	0
1/12/09 22:00	0.0	0.0	0.0	0.0	0	0	0	0
1/12/09 23:00	0.0	0.0	0.0	0.0	0	0	0	0

Table 4.2-9 Predicted Plume Dimensions for the 2, 5, 10, and 20 Dilution Contours at West Outfall,
28-30 January 2009 Event

Date-Time	Plume Area (1,000 sq-ft)				Plume Length (ft)			
	2	5	10	20	2	5	10	20
1/28/09 12:00	0.0	0.0	0.0	0.0	0	0	0	0
1/28/09 13:00	0.0	0.0	0.0	0.0	0	0	0	0
1/28/09 14:00	0.0	0.0	0.0	0.0	0	0	0	0
1/28/09 15:00	0.0	0.0	0.0	0.0	0	0	0	0
1/28/09 16:00	0.0	0.0	0.0	0.0	0	0	0	0
1/28/09 16:30	9.4	147.6	344.0	471.7	97	905	1170	1471
1/28/09 17:00	9.2	215.7	601.0	1063.8	96	1797	2127	2781
1/28/09 17:30	6.7	169.1	509.9	1603.6	82	1469	2781	3560
1/28/09 18:00	6.2	161.7	593.7	1781.8	79	1469	2781	3560
1/28/09 18:30	6.2	132.6	631.8	1736.1	79	1165	2453	3562
1/28/09 19:00	8.2	155.5	698.3	1842.1	91	903	2125	3560
1/28/09 19:30	9.9	136.7	717.2	2192.7	99	683	2453	3560
1/28/09 20:00	7.1	125.9	466.6	2608.5	84	683	1797	3562
1/28/09 20:30	5.4	70.2	332.8	2350.6	73	1165	1799	3154
1/28/09 21:00	0.0	5.1	214.7	1092.1	0	53	2453	3970
1/28/09 21:30	0.0	0.0	0.0	410.4	0	0	0	3973
1/28/09 22:00	0.0	0.0	0.0	0.0	0	0	0	0
1/28/09 23:00	0.0	0.0	0.0	0.0	0	0	0	0
1/29/09 0:00	0.0	0.0	0.0	0.0	0	0	0	0
1/29/09 1:00	0.0	0.0	0.0	0.0	0	0	0	0
1/29/09 2:00	0.0	0.0	0.0	0.0	0	0	0	0
1/29/09 3:00	0.0	0.0	0.0	0.0	0	0	0	0
1/29/09 3:30	3.1	9.2	18.6	34.1	56	102	210	382
1/29/09 4:00	6.6	100.8	317.3	477.5	81	905	1471	1799
1/29/09 4:30	5.2	127.3	438.6	1032.6	72	905	2781	3152
1/29/09 5:00	6.4	179.2	516.0	1238.5	80	1797	2781	4380
1/29/09 5:30	6.0	90.6	454.5	1445.0	78	1165	3560	4382
1/29/09 6:00	6.5	99.6	485.3	1463.8	81	683	2125	3568
1/29/09 6:30	6.6	126.8	527.3	1493.0	81	1167	1797	2125
1/29/09 7:00	6.6	103.8	505.6	1894.6	81	903	2125	2472
1/29/09 7:30	6.2	82.3	290.0	1543.1	79	903	1469	3150
1/29/09 8:00	0.0	10.2	158.1	992.9	0	102	1469	3560
1/29/09 8:30	0.0	0.0	0.0	574.4	0	0	0	3972
1/29/09 9:00	0.0	0.0	0.0	129.0	0	0	0	3972
1/29/09 9:30	0.0	0.0	0.0	0.0	0	0	0	0
1/29/09 10:00	0.0	0.0	0.0	0.0	0	0	0	0
1/29/09 11:00	0.0	0.0	0.0	0.0	0	0	0	0
1/29/09 12:00	0.0	0.0	0.0	0.0	0	0	0	0

Table 4.2-9 Predicted Plume Dimensions at West Outfall, 28-30 January 2009 (Continued)

Date-Time	Plume Area (1,000 sq-ft)				Plume Length (ft)			
	2	5	10	20	2	5	10	20
1/29/09 13:00	0.0	0.0	0.0	0.0	0	0	0	0
1/29/09 14:00	0.0	0.0	0.0	0.0	0	0	0	0
1/29/09 15:00	0.0	0.0	0.0	0.0	0	0	0	0
1/29/09 16:00	0.0	0.0	0.0	0.0	0	0	0	0
1/29/09 16:30	0.0	0.0	0.0	0.0	0	0	0	0
1/29/09 17:00	0.0	0.0	0.0	0.0	0	0	0	0
1/29/09 17:30	5.4	33.3	100.9	172.4	73	284	686	1165
1/29/09 18:00	5.9	107.9	314.0	507.9	77	905	1471	2125
1/29/09 18:30	4.9	77.7	384.8	882.0	70	903	2127	2781
1/29/09 19:00	5.2	39.2	310.9	930.5	72	382	2125	3150
1/29/09 19:30	5.3	72.5	323.0	977.2	72	686	1797	3150
1/29/09 20:00	0.0	29.6	213.3	742.8	0	512	1797	2781
1/29/09 20:30	0.0	0.0	0.0	386.9	0	0	0	3150
1/29/09 21:00	0.0	0.0	0.0	98.0	0	0	0	3560
1/29/09 21:30	0.0	0.0	0.0	0.0	0	0	0	0
1/29/09 22:00	0.0	0.0	0.0	0.0	0	0	0	0
1/29/09 23:00	0.0	0.0	0.0	0.0	0	0	0	0

Table 5-1 Assessment of Achievement of Designated Use for Receiving Waters

<u>CATEGORY¹</u>	<u>WATER QUALITY CRITERIA¹</u>	<u>SUPPORT CRITERIA¹</u>	<u>WATER QUALITY STUDY FINDINGS</u>
Fish Community:	N/A	Best Professional Judgement (BPJ)	No adverse effect predicted to winter flounder or Atlantic cod for which the receiving waters are designated Essential Fish Habitat
Chemistry - Water			
Temperature	ΔT due to a discharge $\leq 2.2^{\circ}\text{C}$ between October and June.	Infrequent Excursions, BPJ (minimum of three samples representing critical period)	Discharge water temperatures are consistent with ambient concentrations
pH	6.5 - 8.5 SU and Δ 0.5 outside the natural background range	Infrequent Excursions, BPJ (minimum of three samples representing critical period)	Monitored pH in discharge waters are consistently within the specified range
Dissolved Oxygen:	>5.0 mg/L 6.5 mg/L - (caution level) ²	Infrequent Excursions, BPJ (minimum of three samples representing critical period)	7.5 - 8.5 mg/L
Toxic Pollutants:			
Ammonia	≤ 14 mg/L (pH 8, 0-10°C, 20-30 ppt) ³	Ammonia is salinity, pH and temperature dependent	≤ 11.2 mg/L
Nonylphenol	7.0 $\mu\text{g/L}$ ⁴	Infrequent excursion from criteria	2.3 $\mu\text{g/L}$
Tolyltriazoles	47,000 $\mu\text{g/L}$ ⁵	Infrequent excursion from criteria	12.2-68 $\mu\text{g/L}$
Toxicity Testing: (Water Column/Ambient)	$\geq 75\%$ survival after 48-hours exposure to ambient water	$\geq 75\%$ survival after 48-hours exposure to ambient water	Tests conducted in media representative of the discharge showed 75% survival in undiluted stormwater; unrepresentative samples indicated that a maximum of eightfold dilution would satisfy the criterion.

1-Assessment Methodology Guidelines for Evaluating Designated Use Status of Massachusetts Surface Waters—2007

2- Massachusetts Water Resource Authority (MWRA)

3- Ambient Water Quality Criteria for Ammonia Saltwater (USEPA, 1989)

4-National Ambient Water Quality Criteria (NAWQC)

5-Pillard et al. 2001



AIR TRANSPORT ASSOCIATION

February 26, 2010

Water Docket
U.S. Environmental Protection Agency
Mail Code 4203M
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Attention Docket ID No. EPA-HQ-OW-2004-0038

Dear U.S. Environmental Protection Agency:

The Air Transport Association of America, Inc. is please to provide the attached comments on the Environmental Protection Agency's *Proposed Effluent Limitation Guidelines and New Source Performance Standards for the Airport Deicing Category*, Docket ID No. EPA-HQ-OW-2004-0038, published in the *Federal Register* on August 28, 2009.

Please contact me at (202) 626-4216 if you have any questions or would like additional information concerning this matter.

Sincerely,

Timothy Pohle
Managing Director – U.S. Environmental Affairs &
Associate General Counsel

Attachment

COMMENTS OF THE AIR TRANSPORT ASSOCIATION OF AMERICA, INC. ON EPA'S
PROPOSED EFFLUENT LIMITATION GUIDELINES AND NEW SOURCE
PERFORMANCE STANDARDS FOR THE AIRLINE DEICING CATEGORY, DOCKET ID
No. EPA-HQ-OW-2004-0038

FEBRUARY 26, 2010

Water Docket
Environmental Protection Agency - Docket Center
EPA West Building
Room 3334
1301 Constitution Avenue, N.W.
Washington, D.C. 20460

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INTRODUCTION

The Air Transport Association of America, Inc. (“ATA”) is pleased to provide the following comments on the Environmental Protection Agency’s (“EPA” or “Agency”) *Proposed Effluent Limitation Guidelines and New Source Performance Standards for the Airport Deicing Category*, Docket ID No. EPA-HQ-OW-2004-0038, published in the *Federal Register* on August 28, 2009.¹ ATA submits these comments in its capacity as the principal trade and service organization of the U.S. airline industry with ATA’s airline members and their affiliates representing more than 90 % of all U.S. airline passenger and cargo traffic. The members of ATA are: ABX Air, AirTran Airways, Alaska Airlines, American Airlines, ASTAR Air Cargo, Atlas Air, Continental Airlines, Delta Air Lines, Evergreen International Airlines, FedEx Corporation, Hawaiian Airlines, JetBlue Airways, Southwest Airlines, United Airlines, UPS Airlines, US Airways; associate members are: Air Canada, Air Jamaica Ltd., Mexicana.

As the Agency knows, this issue is not new to our industry. In fact, the airlines have played a leading role in minimizing the impact to the environment of deicing fluid – the application of which to aircraft and airfields is essential to aviation operations and, above all, safety. With specific respect to development of this Effluent Limitation Guideline (“ELG”) proposal, we collaborated closely with EPA when it was first considering developing an ELG in the late 1990’s. In that process, ATA and its member airlines provided detailed information to the Agency regarding aircraft and airport deicing, much of which EPA used in its *Preliminary Data Summary: Airport Deicing Operations (Revised)*.² Similarly, we have served as a resource to EPA for the last five and one-half years as the Agency has developed its current proposal.

¹ 74 Fed. Reg. 44676 (August 28, 2009).

Note on Citations, Acronyms and Terminology.

Citations: We will generally refer to the Proposal as “The Proposed Rule” or the “Proposed Deicing ELG;” citations to the preamble to the Proposed Rule published in the *Federal Register* will use the following format: Notice at [Page Number]. Citations to the principal supporting documents will be as follows:

- *Technical Development Document for Proposed Effluent Limitation Guidelines at Standards for the Airport Deicing Category (July 2009):* TDD at [Page Number]
- *Economic Analysis for Proposed Effluent Limitation Guidelines at Standards for the Airport Deicing Category (July 2009):* EA at [Page Number]
- *Environmental Impact and Benefit Assessment for Proposed Effluent Limitation Guidelines at Standards for the Airport Deicing Category (July 2009):* EIB at [Page Number]

Citations to documents included in docket for this rulemaking, EPA-HQ-OW-2004-0038, will be in the following format: Document –[number]at [Page Number]. For example, document EPA-HQ-OW-2004-0038-0167 would be cited as Document –0167 at [Page Number]. Citations to specific provisions of Proposed Part 449, Subpart A will refer only to the proposed section number, without citation to the page of the Notice on which it appears, in the following format: Proposed § [Section Number].

Acronyms and Terminology: We have attached APPENDIX A - *Summary of Proposed Rule*, which establishes the nomenclature and acronyms used in the discussion below. Also airports are referred to using their three-letter codes – a list of U.S. airports and their corresponding codes is provided in APPENDIX B – *Airport Codes*. (This list is limited to the airports surveyed by EPA, but includes all airports to which we refer herein.)

² EPA-821-R-00-016 (August 2000); included in the record as Document – 0107.

Throughout this period, ATA has consistently expressed its concern that the ELG Program is a poor fit with this industry. Specifically, our concern has been that because management of stormwater associated with airport deicing is dictated by a multitude of complex factors and these factors vary widely across airports, the derivation of uniform national standards contemplated under the ELG program would be impossible. Now, seeing the Proposed Rule and its supporting Record, we are convinced that our concern was well-founded. Despite what we know are the Agency's best intentions, the Proposed Rule and its supporting Record simply fail to characterize accurately and account for these factors, which distinguish this industry from every other industry for which EPA has promulgated ELGs.

Unlike other ELG industries, airport deicing – which includes both deicing of aircraft and airfield pavements like runways – is an activity required to ensure public safety and already subject to stringent regulation by another federal agency, the Federal Aviation Administration (“FAA”). In the air transportation industry, ensuring the safety of passengers, crew and the public is and always must be the overriding imperative. Consistent with Congressional policy, “safe operation of the airport and airway system is the highest aviation priority.”³ Accordingly, safety of flight, including departure operations, and the safe ground operation of aircraft cannot be assumed but must be actively ensured, separately, at each individual airport. The complexities inherent in fulfilling this safety imperative, led by the Federal Aviation Administration (FAA), distinguish our industry from other industries for which EPA has developed effluent guidelines in the past.

This industry presents another unique and challenging attribute because its “product” – air transportation – is a service that Congress has determined to be of national importance. As the Agency is aware, federal policy requires that the National Airspace System (“NAS”) operate so as to accommodate demand for air transportation services to the maximum extent possible. Meeting this standard is a challenge in the best of times, with fierce competition driving fares to minimums. It is even harder in the context of events that have unfolded in the past decade which have presented unprecedented economic challenges for the aviation industry. Developing an ELG, which could result in a significant reduction in service, for an industry in which service reduction runs counter to express federal policy requires analyses that are unprecedented in other ELG rulemakings, as well as assessments of cost, economic achievability and non-water quality impacts that are far different from and more sensitive than any previously employed.

The size and cost of the collection and treatment systems that must be utilized by airports also distinguishes this industry from industries that EPA has successfully regulated under the ELG Program. Unlike wastewater collection in a steel mill, for example, which is accomplished by a length of pipe, collection of deicing runoff occurs on a scale similar to and by means consistent with those of municipal wastewater collection systems, which are not subject to the ELG program. As is the case with municipal systems, airport infrastructure representing millions of dollars of sunk costs tracks, or must be made to track, through a larger, complex built environment representing a billion or more dollars at each airport. Not surprisingly, each system is unique and performs differently. Also, like municipal systems, large airport infrastructure projects take years to design, require investments of tens or hundreds of millions of dollars, and must be implemented in a manner that ensures vital public service is not interrupted.

³ See 49 U.S.C. § 47101(a)(1).

The airport deicing industry also is unique in that it has continuously pursued technological innovations aimed at reducing impacts to the environment. For example, airlines led the successful effort to incorporate environmental criteria into the certification standard for Type I aircraft deicing fluids which ensured aircraft deicing fluid (“ADF”) manufacturers would eliminate the use of certain substances and reduce the toxicity of these fluids to extremely low levels. EPA catalogues in the Record many of the other industry innovations and efforts to reduce the amount of fluid that is needed while still maintaining safety. At present, there are new fluids entering the market with much lower oxygen demand profiles and new ice-phobic coating technologies are being tested and developed that may drastically reduce fluid usage in the future. Accommodating such rapid and continuous development of pollution prevention technologies is a unique challenge – particularly at this time, when technologies currently under development hold the real promise of enabling (in the near to mid-term) significant further reductions in the very environmental impacts addressed by the ELG now under consideration. Yet, this ELG process has proven unable to meet this challenge.

Finally, the variation in this industry is unlike any other industry regulated under the ELG Program. Soap factories are soap factories. Canmaking plants are canmaking plants. Their processes are roughly uniform; their raw wastewater, the result from systematic, repetitive processes, designed and controlled by man, can be characterized by flow and load; and their treatment processes can be designed and positioned largely at will in or adjacent to plant buildings. None of these descriptions apply to airport deicing operations. Airport deicing is an activity dictated as much by the natural environment as it is controlled by people. The very existence of this activity is under the control of weather, and its intensity and resulting wastestream rise and fall as a complex function of weather, flight schedules, fleet mix and a host of other airport-specific variables. *Not* a canmaking plant.

Moreover, airport deicing is both defined and constrained by the need to enable the safe, smooth and uninterrupted flow of aircraft into the NAS. This operational need itself is a complex function of safety constraints, regulatory mandates from the FAA, and the intricate coordination that allows the aviation community to safely land, taxi, service and dispatch tens of thousands of flights a day from airports around the country during inclement winter weather. *Not* a soap factory.

Thus, it is not just the degree of variation among airports (and the airline operations at airports) that distinguishes the industry, it is also the sheer number and variety of significant variables, including: the role of the airport in the NAS, the degree of congestion at the airport and its associated airspace, the number and types of aircraft operations, the entities within the airport that may be involved in deicing (the airport, airlines, airlines on behalf of other airlines, fixed base operators (“FBOs”)), climate (type and amount of precipitation), land availability, geography (*e.g.*, proximity to water bodies) and geology of the site, existing stormwater infrastructure, etc. Further, many of these variables are independent of each other – the degree of variation between two airports with respect to one parameter does not predict the degree of variability with respect to another.

To this complex industry, however, the Agency has applied the traditional tools that it uses to develop ELGs for traditional industries. In those other contexts, simple averages can be meaningful; linear extrapolations may be accurate enough; and simple, abstract metrics might be

sufficiently predictive of reality to provide a reasoned basis for rulemaking. Applied to this industry, those convenient simplifications have produced one-size-fits-all solutions that fail to account meaningfully for the wide variability and complex interactions of factors that shape airport deicing. The decision to take this approach is particularly curious given that EPA acknowledges the degree to which this industry diverges in kind from other industries and the site-specific nature of the activity it is attempting to regulate. The Agency's traditional methodologies and processes have produced a "result," but one which is severely compromised by the inability of those methodologies and processes to analyze this industry with a reasonable degree of accuracy. Contrasted with the uniform historical practice of the industry itself, which recognizes the need to apply detailed, site-specific analysis to support improvements of the kind proposed here, we believe that the Record here reaches its result without finding the answer.

For all of the reasons stated above and examined in greater detail throughout these comments ATA believes that it is not possible for EPA to develop an ELG consistent with Clean Water Act ("CWA") and other statutory mandates. As a result, we recommend that the Agency formally reconsider and reverse its 2004 designation of airport deicing as an industry suitable for ELG rulemaking. Should the Agency choose to proceed with this rulemaking despite these concerns, at a minimum it must comprehensively modify its approach to meet the fundamental challenges this industry presents. For example, a BMP-based ELG, or one that establishes a decision matrix for use as a design tool at individual airports may prove more appropriate and sustainable than the universally-applicable numeric performance standards contained in the Proposed Rule. Even less extensive changes to the proposed ELG, however, still will be substantial, and will require re-proposal or additional public notice following the collection of additional information and issuance of a Notice of Data Availability ("NODA").

ATA's written comments are structured accordingly. In "Part One – General Comments" we present a series of practical proposals consisting of:

- (1) de-listing the airport deicing industry – *see* Section I;
- (2) re-proposal or publication of a NODA after re-configuration of the current proposal - *see* Section II; and
- (3) modifications that *at a minimum* would be necessary if the Agency chooses to pursue development of an Deicing ELG - *see* Section III.

The common element of these proposals is the desire to identify potentially supportable next steps to a process that we believe has so far failed to meet its statutory obligations.

In "Part 2 – Specific Comments" we catalogue and analyze in detail our concerns with the Proposed Rule and the rationales offered in support. In short, the Record fails to support the current proposal. Most critically, the Agency fails to consider safety adequately (*see* Section IV) and also fails to consider meaningfully the impact of the proposed standards on aircraft operations and the NAS (*see* Section V). It is not possible to ascertain the reasonableness of any requirement applied to this industry unless and until the impact on safety and operations is first completed. We also demonstrate that the Agency – even if one accepts its rationales for its metrics and formulas (which we do not) – fails to apply the metrics and formulas correctly, leading it to underestimate capital costs by *over a billion dollars and annual costs by nearly \$90*

million (see Section VI) These comments provide the detailed basis for our extensive concerns with the proposal and the rationales for the practical proposals offered in Part I.

ATA remains committed to working with EPA -- in cooperation with the FAA -- to continue to improve the quality of discharges originating with airport deicing operations. It is our fervent hope that this ELG process will assist, rather than impede, that ongoing process of improvement and we stand ready to work with EPA to achieve that shared objective.

PART 1 – GENERAL COMMENTS

I. EPA SHOULD WITHDRAW THE PROPOSED RULE AND REMOVE THE AIRPORT DEICING INDUSTRY FROM THE EFFLUENT GUIDELINES PLAN

The effort to develop an ELG for the airport deicing industry presents challenges unprecedented in the history of the Effluent Guidelines Program. Upon careful and considered review of the issues raised by EPA’s attempt to craft a workable ELG for this industry, ATA believes that any reasoned analysis compels the conclusion that it is not possible to develop reasonable, legally sustainable standards of the type and nature required under the program in this instance. In addition, Congress has delegated authority to ensure the safe and effective operation of the NAS exclusively to the FAA. Application of the ELG program to this industry necessarily will interfere with Congressional policy and regulatory prerogatives Congress has granted exclusively to the FAA. As a result, EPA should decline to go forward with an ELG as applied to this industry. Thus, ATA respectfully urges EPA to withdraw the Proposed Rule and take those administrative actions necessary to remove the Airport Deicing Industry from the list of industries to be regulated contained in its 2004 Effluent Guidelines Plan (“EGP”).

A. A Deicing ELG Necessarily Would Conflict With the Existing Comprehensive and Exclusive Regulatory Scheme Governing Aviation Safety and Operations

Congress has long recognized that commercial aviation safety and the efficiency of the NAS depends on the application of a consistent set of regulatory requirements by a primary federal agency – the Federal Aviation Administration (“FAA”) – with the necessary expertise and capability to develop and administer those requirements. Congressional policy further recognizes that the successful integration of each airport into the system implicates not only aircraft operations, but also infrastructure, facilities, and support operations that most appropriately fall within the primary and exclusive jurisdiction of the FAA.

To that end, the Federal Aviation Act establishes “a *uniform and exclusive* system of federal regulation” of aircraft operations to be administered by the FAA. *Burbank v. Lockheed Air Terminal, Inc.*, 411 U.S. 624, 639 (1973) (emphasis added).⁴ Congress has affirmed repeatedly its intent that this system of federal regulation maintain the primacy of safety⁵ and

⁴ See also *Abdullah v. American Airlines, Inc.*, 181 F.3d 363, 370 n.10 (3d Cir. 1999) (aviation regulation is an area where “[f]ederal control is intensive and exclusive.”) (quoting *Northwest Airlines, Inc. v. Minnesota*, 322 U.S. 292, 303 (1944)).

⁵ See e.g. 49 U.S.C. § 40101(a) [emphasis added]: “[T]he Secretary of Transportation shall . . .

(1) assign[] and maintain[] safety as the ***highest priority*** in air commerce.

. . .

(3) prevent[] deterioration in established safety procedures, recognizing the ***clear intent, encouragement, and dedication of Congress*** to further the ***highest degree of safety in air transportation and air commerce***, and to maintain the safety vigilance that has evolved in air transportation and air commerce and has come to be expected by the traveling and shipping public.

accommodate, to the maximum extent possible demand for air transportation.⁶ Congress also has affirmed the need to meet environmental objectives consistent with maintaining safety and ability of the NAS to accommodate the needs of the nation's economy and culture.⁷ It is without question, however, that the FAA wields primary and exclusive jurisdiction over air safety and the operation of the NAS.⁸

This pervasive federal regulatory scheme extends to both aircraft in flight and aircraft-related operations on the ground. *See, e.g.*, 49 U.S.C. § 40103(b)(2)(B)-(C); *Burbank-Glendale-Pasadena Airport Authority v. City of Los Angeles*, 979 F.2d 1338, 1341 (9th Cir. 1992) (Federal Aviation Act preempts any regulatory “interference” with the operations of aircraft on the ground); *City of Houston v. FAA*, 679 F.2d 1184, 1195 (5th Cir. 1982) (FAA has regulatory authority “not only [over] the corridors of air traffic, but the use of airports as well”).

The nation's commercial aircraft are part of an intricate, interconnected, time-sensitive network in which the smooth and seamless movement of aircraft is critical to keeping flights running safely and efficiently. Aircraft operate on tightly orchestrated schedules where reliability and performance are critical to the safety and efficiency of the NAS, a realm regulated pursuant to the exclusive jurisdiction and authority of the FAA. This is not to the exclusion of sound environmental management or regulation, as environmental impacts associated with airport deicing can and must be appropriately addressed. Indeed, many environmental impacts have been and continue to be successfully addressed consistent with FAA's exclusive authority over aircraft operations and the NAS – this includes water quality impacts, which have been and continue to be appropriately and successfully addressed through the National Pollution Discharge Elimination System (“NPDES”) program.

By its very nature, the ELG program, however, cannot be implemented without necessarily dictating aircraft operations and affecting management of the NAS. This is not the result of setting environmental standards *per se*, but rather of setting the particular type of standard the ELG program requires. As EPA explains, “[e]ffluent guidelines and new source performance standards are *technology-based* regulations”⁹ The standard setting process under the ELG program depends on identifying water quality control technologies deployed

See also § 47101(a) [emphasis added]: “It is the policy of the United States – (1) that the safe operation of the airport and airway system is the **highest aviation priority**.”

⁶ *See*, § 47101(a): “It is the policy of the United States – . . . (7) that construction and improvement projects that increase the capacity of facilities to accommodate passenger and cargo traffic be undertaken to the maximum feasible extent so that safety and efficiency increase and delays decrease.” *See also e.g.*, 49 U.S.C. § 40101(a)(4), (6), (7), (10) and (11).

⁷ *See*, § 47101(a): “It is the policy of the United States – . . . (6) that airport development projects under this subchapter provide for the protection and enhancement of national resources and the quality of the environment in the United States.”

⁸ *See*, 49 U.S.C. § 40103(b): “The Administrator of the [FAA] shall develop plans and policy for the use of the navigable airspace and assign by regulation and order the use of the airspace necessary to ensure the safety of aircraft and the efficient use of airspace.”

⁹ Notice at 44,678, col. 3 (emphasis added).

within a particular category and, using the technology identified as achieving a water quality standard, setting the standard.

In lay terms, in setting standards under the ELG program EPA identifies technologies deployed by members of the industry achieving the highest level of water quality control and requires that other members of the industry meet the same level water quality control. EPA explains in the Notice:

The legislative history of CWA section 304(b), which is at the heart of the effluent guidelines program, describes the need to press towards higher levels of control through research and development of *new processes*, modifications, replacement of obsolete *plans and processes*, and other improvements in technology, taking into account costs.¹⁰

The irreconcilable problem in the context of this industry is that the “technologies” are deployed on an airport-specific basis only after weighing complex interrelated factors at the particular airport, which themselves require highly sophisticated consideration before they can be evaluated. Among these factors are the technology’s effect on: (a) safety of aircraft and airport operations, (b) efficiency and reliability of aircraft operations, and (c) effect on the NAS. EPA appears to understand the selection of technologies depends on a variety of site-specific factors, including operational factors, as demonstrated by the following excerpts from the Record:

Each method of collection, treatment or recycling, or pollution prevention selected by an airport or airline often ***depends on a variety of airport-specific or airline-specific factors***, including climate, amount of chemical deicing and anti-icing agents applied, number of airlines operating at a particular airport, aircraft fleet mix, number of aircraft operations, costs, presence of existing infrastructure, availability of land, and affect [sic] ***on aircraft departures***.¹¹

EPA analyzed several factors to determine whether subcategorizing an industrial category and considering different technology options for those subcategories would be appropriate. For this analysis, EPA evaluated the characteristics of the industrial category to determine their potential to provide the Agency with a means to differentiate effluent quantity and quality among facilities. ***EPA also evaluated*** the design, process, and

¹⁰ Notice at 44,678, col. 3 (emphasis added). We note that a primary Congressional concern animating section 304(b) – the need to prevent the proverbial “race to the bottom” by states seeking to attract industry to their jurisdiction – generally does not apply to airports. See *Technical Support Document for the Preliminary 2010 Effluent Guidelines Program Plan* at 1-2 (October 2009) (“Creating a single national pollution control requirement for each industrial category based on the best technology the industry could afford was seen by Congress as a way to reduce the potential creation of “pollution havens” and to set the Nation’s sights on attaining the highest possible level of water quality.”).

¹¹ TDD at 8-1 (emphasis added).

*operational characteristics of the different industry segments to determine technology control options that might be applied to reduce effluent quantity and improve effluent quality.*¹²

EPA found that the largest cost to the airlines associated with aircraft deicing was the cost of delaying departure of the aircraft. Therefore, the airlines have a great interest in providing input on the various approaches that an airport may consider when trying to control discharges from airport deicing operations. For instance, *depending on an airport's runway and taxiway configuration, the use of centralized deicing pads may potentially create or reduce departure delays.* However, the greatest potential economic impact to the industry from *implementing capital improvements to reduce discharges from airport deicing operations may be a reduction of quality or frequency of service to airports* that do not serve large cities (*i.e.*, smaller airports). For example, *an airline may choose to operate less flights per day into a particular airport or to operate smaller aircraft on that route.*¹³

[M]any operational decisions concerning deicing are made on the basis of how they will impact on-time performance. For example, a carrier's operational preference for gate/apron deicing as opposed to central deicing pad deicing, where both types of deicing are available, will depend on which is less likely to cause delays; *it may be more difficult to coordinate activities of several carriers at a common-use centralized deicing pad without causing delays.*¹⁴

Thus, when EPA undertakes the necessary review of the airport deicing industry to identify technologies on which to base its ELG, it cannot do so without simultaneously identifying specific configurations of aircraft and airport operations that are unique to a specific location precisely because the configurations and operations are the result of a complex and delicate balance of airport-specific safety and operational concerns as they relate the NAS. This is particularly true of the largest airports which not only have huge volumes of highly varied types of air traffic to manage, but which play critical roles in the NAS.

The inextricable interplay between the ELG technology-based approach and the aircraft and airport operations creates an inherent conflict between FAA's exclusive authority in the areas of aviation safety and efficient operation of the NAS and EPA's efforts to use the ELG as a regulatory tool in this instance. Indeed, as detailed throughout these comments, should the EPA proceed with implementation of the ELG, it will create situations where operations within the NAS will be severely affected and force airlines and airports, in cases where safety otherwise

¹² TDD at 2-1 (emphasis added).

¹³ Document - 0107 at 1-5 to 1-6 (emphasis added).

¹⁴ Document - 0107 at 14-35 (emphasis added).

would be compromised by virtue of the ELG, to cease or curtail operations to avoid the unsafe conditions. In such a case of conflict, the law compels that EPA yield in promulgating an ELG.

As noted above, Congress has determined aviation safety to be paramount and has given FAA the exclusive authority to regulate aviation safety and the operation and efficiency of the NAS. Where such mandates exist, even where Congress has given other federal agencies regulatory powers that may overlap, the courts have found preemptive effect in one federal provision over the other where there is a “plain” or “clear repugnancy” between them,¹⁵ which the Supreme Court has held includes cases where two federal provisions are “clearly incompatible.”¹⁶ EPA’s use of the ELG, which necessarily is based on aircraft and airport operations-dependent information and sets standards which then implicate aircraft and airport operations, is clearly incompatible with the overriding aviation safety and operations mandates under federal aviation law as implemented by FAA.

We are not saying that any attempt by EPA to regulate environmental impacts from aviation is preempted as being “clearly incompatible.” In fact, EPA has long used the NPDES program under the CWA to address runoff from deicing operations. That the NPDES program does not pose the incompatibility of the ELG almost certainly is due to the site-specific analysis that goes into determining what water management practices make the most sense at each, individual airport. In contrast, the ELG would set a uniform, national, technology-based standard.¹⁷

It is no answer for EPA to assert that it is not purporting to require airports or airlines to adopt a particular technological solution. Even if airports and airlines are free to adopt any

¹⁵ See, e.g., *Posada v. Nat’l City Bank*, 296 U.S. 497, 503 (1936).

¹⁶ See *Credit Suisse Securities (US) v. Billing*, 551 U.S. 264 (2007) (finding federal securities law to preclude application of federal antitrust law provisions).

¹⁷ Of course, Congress has not expressly addressed the relationship between the ELG Program and Federal Aviation Laws. This is not surprising given that it is only after nearly 40 years and promulgating ELGs for nearly 60 other industries (which include over 450 subcategories) that EPA is attempting to address this industry. What is clear is that where Congress has considered expressly the relationship between aviation safety and environmental standards, it has concluded that ensuring aviation safety must have primacy. In *Lockheed Air Terminal, Inc.*, for example, the Supreme Court noted that while EPA was granted a consultative role in determining noise regulations under the Noise Control Act of 1972, the FAA held ultimate authority regarding the content of noise regulations, including authority to make a decision “adverse” to EPA’s recommendations. Under current law (the Airport Noise and Capacity Act of 1990) FAA holds exclusive authority to approve or disapprove any new airport noise or access restriction. 49 U.S.C. § 47524. Any such restriction must “not create an unreasonable burden on interstate or foreign commerce,” and be “not inconsistent with maintaining the safe and efficient use of the navigable airspace.” § 47524(c)(2)(B) and (C). Again, this is not to say that aviation safety completely displaces environmental concerns, but that in balancing them aviation safety is primary. In setting forth policies to be followed in the aviation context Congress first stated “(1) that safe operation of the airport and airway system is the *highest* aviation priority,” then listed other policy objectives, including “(6) that airport development projects . . . provide for the protection and enhancement of natural resources and the quality of the environment in the United States.” See 49 U.S.C. §47101(a) (emphasis added).

practice that achieves the standard, this does not obviate the fact that the standard itself is based on an operations-dependent technology. In any event, as is more than apparent in this proceeding, the ELG effectively mandates technology solutions that necessarily and improperly implicate operations when applied. For example, EPA “estimates that [CDPs] allow airports to capture about 60 % of available ADF”¹⁸ and on the basis of that model technology, establishes a 60% collection efficiency standard for Tier One airports.¹⁹ The Record identifies no other collection technology capable of achieving this standard²⁰ and EPA has confirmed that the 60% collection standard is based on use of central deicing pads (“CDPs”) for all aircraft deicing operations.²¹ Thus, EPA dictates, if not directly then (just as impermissibly) indirectly, aircraft operations, airport capacity and the role the airport may play in the NAS during winter operations. This it cannot do and – given the nature of the derivation of technology-based standards, we do not see how it is possible to derive such standards without impermissibly intruding into areas under FAA’s exclusive jurisdiction.

The fact that ELG standards are implemented through the states acting pursuant to the authority of state law compounds the problem. State permit writers lack expertise in matters of airport/aircraft safety and are unfamiliar with the complexity and sensitivity of aircraft operations within the NAS. To pursue such a scheme will inject uncertainty and unpredictability into the regulatory scheme and adversely affect the public’s right to safe and efficient air travel. More importantly, state permit writers, certainly when acting under the auspices of state law,²² do not have authority to affect aircraft operations either in the air or on the ground. Thus, not only are ELG technology-based standards are fatally flawed in this context because they are based on a review of technologies that are necessarily deployed only after careful study and reconciliation of site-specific safety and operational complexities, but because they are implemented through

¹⁸ Notice at 44686, col. 3.

¹⁹ Notice at 44686, col. 3.

²⁰ The Proposed Rule identifies two other candidate collection technologies. Glycol recovery vehicles (“GRVs”), to which it ascribes a collection efficiency of 20%, are identified as the Best Available Technology Economically Achievable (“BAT”) model collection technology for Tier Two airports, while Plug-and-Pump systems are described as capable of achieving a collection efficiency of 40% but were not selected as a model technology owing to their excessive cost.

²¹ Telephone conference between E. Strassler, EPA, and T. Pohle, ATA (February 2, 2010). The proposal’s reliance exclusively on centralized deicing pads to achieve compliance with the proposed Tier One collection standard is confirmed by the inclusion in the Proposed Rule of a technical specification requiring that “[a]ll aircraft deicing . . . take place on a centralized deicing pad, with the exception of deicing for safe taxiing” in order for an airport using centralized deicing pads to be deemed to be in compliance with Tier One collection standards. Proposed § 449.20(b)(1)(ii)(A). It is further supported by the requirement of Proposed § 449.20(b)(1)(i)(C) that centralized deicing pads deemed to comply with the BAT standard “shall be sized to accommodate the airport’s peak hourly departure rate.” There is a very limited exception for pre-taxi deicing.

²² 33 U.S.C. § 1342(b) (state NPDES permitting programs, while approved by EPA, are authorized and operate under state law). 46 of the 50 states currently operate EPA-approved NPDES permit programs under the auspices of state law.

state authorities who are far removed from the complex safety and operational sphere and, most importantly, without any authority to regulate within that sphere.

In sum, and as further demonstrated throughout these comments, as applied to airport deicing, the Proposed Rule violates Congressional policy and the purposes underlying the Federal Aviation Act in numerous respects:

1. By failing to acknowledge that safety considerations must override all other considerations and must be the final decision criterion for all deicing-related operational and design decisions by airlines and airports;
2. By relegating to a secondary consideration, the federal mandate and industry commitment to the safety of the flying public in the context of the most challenging ground icing conditions;
3. By disregarding and effectively usurping the principal role of the FAA in the comprehensive regulation of the industry intended by Congress and embodied in law and well-reasoned policy including:
 - a. FAA's primary and exclusive jurisdiction over commercial aviation and operational issues related to safety;
 - b. FAA's expertise and resources in matters related to aircraft operations and safety;
 - c. Responsibility for the smooth and uninterrupted functioning of the NAS;
 - d. Detailed standards for the placement of airfield infrastructures and vehicles of the kind anticipated by the Proposed Rule;
 - e. Authority to review and approve -- or reject -- the design of such structures;
 - f. Approval authority over funding streams available to support airfield improvements, including those required for pollution control; and
 - g. Failing to consider that proposed ELG provisions must also be interpreted and applied consistent with the Airline Deregulation Act ("ADA") and the broad preemptive purpose reflected in its prohibition of any state action to "enact or enforce a law, regulation, or other provision having the force and effect of law related to . . . the service of an air carrier . . ." 49 U.S.C. § 41713(b)(1).²³

²³ As the Supreme Court has held, the ADA's language "express[es] a broad preemptive purpose," and even indirect regulation of airlines by generally applicable state laws is preempted if those laws have "a significant effect" on services. *See Morales v. Transworld Airlines*, 504 U.S. 374 (1992) (holding that ADA preempted state law requirements that expressly referred to airlines and established "binding requirements" upon them). Under *Morales*, any interpretation of the proposed ELG provisions to direct the manner in which airlines are to conduct their operations, or the timing and efficiency of those operations, necessarily affects airline services, and would fall within the scope of state and local regulatory actions that the ADA was designed to preempt. *American Airlines v. Wolens*, 513 U.S. 219, 232 (1995). *See also Rowe v. New Hampshire Motor Transport Association*, 552 U.S. 364 (2008) (reaffirming the broad ADA preemption test set forth in *Morales* and holding there is no "public health"

4. By elevating state permit writing entities to a role well beyond their expertise and familiarity in the regulation of aircraft operations inextricably tied to aircraft deicing.
- B. The ELG Program Cannot Be Applied to this Industry Consistent With the CWA**
1. **National, Uniform Standards of the Type Called for Under the ELG Program Cannot Be Reasonably Applied to this Industry**

As EPA recognizes, airport deicing is shaped by a complex array of site-specific factors. As a result, the ELG program, which depends on the implementation of uniform national standards cannot account effectively for the variability inherent in this industry. The Record here demonstrates how manifold variability across this industry precludes the derivation of coherent, national standards applicable to stormwater effluent. Indeed, as the following excerpts demonstrate, the Record is replete with statements acknowledging this reality and the degree to which it distinguishes the “airport deicing industry” from industries EPA typically addresses in the ELG program:

In many other industrial sectors, wastewater is typically generated and handled in confined systems such as reactors, pipes and pumps. Wastewater flows are carefully managed in these systems, and under normal operations all wastewater is directed to the facility’s treatment system or to a POTW. In aircraft deicing operations, the chemicals are sprayed outdoors in a comparatively unconfined, usually designated setting, and there is a high likelihood that some pollutants will bypass the treatment system. Setting a minimum collection rate in the proposed rule, based on available technology, will require an airport to reduce significantly its level of uncontrolled discharges in an economically achievable manner.²⁴

The airlines’ process of applying ADF to aircraft through high pressure spraying, combined with their typical practices of spraying the aircraft outdoors in multiple, large unconfined (but usually designated) spaces, results in pollutants being dispersed over a wide area and entering storm drains at multiple locations. This process contrasts sharply with many other industries where pollutants are generated in confined areas, managed through a piping system, and not commingled with precipitation.²⁵

exception for laws having a “‘significant impact’ on carrier rates, routes or services”) (quoting *Morales* at 388, 390) (emphasis omitted).

²⁴ Notice at 44689.

²⁵ Notice at 44686.

Given the highly variable nature of storm events, it is difficult to estimate flows or concentrations of ADF-contaminated stormwater generated at an airport. Those factors are greatly dependent on the size of the storm event associated with the discharge, drainage characteristics, ADF collection systems (if present), and airport operations. Additionally, due to the design of drainage systems at some airports, their discharges may occur well after a storm event has completed.²⁶

Pollutant loadings from airport deicing operations are challenging to estimate because they are highly variable and airport-specific. Because the use of deicing and anti-icing chemicals is weather dependent, the pollutant loadings at each airport vary based on weather conditions. The pollutant loadings also vary from airport to airport based on each airport's climate. In addition, the amount of applied chemical that is discharged to surface water is airport specific, based on the existing stormwater separation, collection, and/or containment equipment present at each airport.²⁷

After acknowledging the complexity and variability within the industry category, EPA nonetheless proceeds to propose the blunt application of technology-based approaches across the industry, divided only into two tiers. As a result, EPA is not able to justify application of the derived standards to the airports that fall into the two tiers. For example, EPA itself is unable to explain the derivation of the 60% collection standard applicable to Tier One airports. The Agency is only able to assert that it “estimates that facilities effectively operating a centralized deicing pad recover 60% of applied glycol.”²⁸ The Agency does not explain how this “estimate” was made or precisely what constitutes “effective operation” of the technology. In fact, the Agency acknowledges that achievement of any level of collection efficiency is so subject to variability that even if CDPs are operated in compliance with the technical specifications set forth in §449.20(b)(1)(ii) – presumably its version of “effective operation” of CDPs – they will not “always capture at least 60%.”²⁹ If the model technology does not always meet the standard for which it provides the basis, it is not properly a standard.

This is not meant as criticism of the Agency. We empathize with the inability to articulate a reasonable basis for ELGs applied to this industry precisely because we believe it is not possible to do so. In sum, and as further detailed throughout these comments, some of the factors contributing to the impossibility of regulating this industry through an ELG, include:

1. Unprecedented variability between airport facilities and infrastructure that dictates both the cost and the availability of model treatment technologies, including wide disparities in:

²⁶ Notice at 44686.

²⁷ Notice at 44696.

²⁸ TDD at 9-5.

²⁹ Email from E. Strassler, EPA, to J. Steinhilber, ACI-NA (Jan. 22, 2010).

- a. Land availability, particularly for highly regulated structures;
 - b. Facility and airport age; and
 - c. Existing infrastructure (which in many cases has been dictated by prior NPDES permits that have driven airports to adopt management and treatment philosophies incompatible with those embodied by the Proposed Rule);
2. The types, intensities and operational needs of widely varying aircraft operations (including passenger and cargo operations with fundamentally different needs; hub airports serving large banks of nearly simultaneous departures in contrast with small feeder airports with scattered, infrequent departures; cargo-dominated airports; and airports serving substantial international schedules);
 3. Fleet mixes ranging from schedules dominated by regional aircraft to airports serving all classes of commercial aircraft;
 4. A process -- deicing -- unlike any other source of industrial discharge ever subjected to an ELG because it comes into existence, has its intensity defined by, and ceases to generate wastewater solely as a function of weather-related events that require incident-specific responses directly affecting safety of aircraft passengers and the general public;
 5. A wastestream whose volume and concentration are almost exclusively a function of stormwater runoff and snow melt;
 6. A wastestream whose volume is a direct function and result of a critical safety activity that does not lend itself readily to regulatory constraints;
 7. The continuous and rapid evolution of deicing practices and materials that have and continue to change deicing operations at a fundamental level, making static regulation difficult and, (in critical respects) counter-productive; and
 8. Infrastructure of a complexity and cost comparable to those of municipal wastewater collection systems and not the industrial plant or land area addressed by other ELGs.

2. Some of the Model Technologies Cannot Be Designed, Financed and Constructed Within the 3-Year Implementation Period Required Under the ELG Program

The CWA requires compliance with effluent limitations established on the basis of an ELG within 3 years of the date on which those limitations are first incorporated into a facility's NPDES permit.³⁰ In light of this, technologies with a longer lead time than 3 years are not acceptable candidates as model technologies in an ELG. Otherwise, ELGs could designate as models technologies that are incapable of application within a discharger's statutory compliance period, effectively placing all affected dischargers in noncompliance. Such long-lead time

³⁰ 33 U.S.C. § 1311(b)(3)(B).

technologies, therefore, are unavailable within the terms of the ELG Program and are disqualified from consideration as “model” technologies in any ELG rulemaking.

While model technologies such as the use of glycol recovery vehicles (“GRVs”) and the substitution of other pavement deicing materials for urea might be capable of being implemented within this time span, the design, funding and construction of CDPs and their appurtenances at Tier One airports and the implementation of anaerobic fluidized bed reactors (“AFBR”) treatment systems at both Tier One and Tier Two airports in many – if not all – cases cannot be implemented within a 3-year compliance period. Thus, EPA must eliminate these and any comparable long-lead time technologies from consideration in this rulemaking and identify alternative, available model technologies that are not disqualified by the statutory terms under which the ELG Program operates.

C. Removal of the Airport Deicing Industry from 2004 Section 304(m) List Will not Adversely Affect Efforts to Limit the Release of Deicing Fluids to the Environment

For a number of reasons, removal of the Airport Deicing Industry from 2004 Section 304(m) List will not adversely affect efforts to limit the release of deicing fluids to the environment. Among the more significant considerations in this regard are the following factors, which are addressed elsewhere in these Comments:

1. Aircraft deicing will continue to occur within the confines of a highly regulated industry and airport water quality impacts, have been and will continue to be appropriately and successfully addressed through the NPDES (now Multi-Sector General Permit (“MSGP”)) program – this permit system should be left intact;
2. EPA already has numerous tools available to regulate deicing fluids;
3. Voluntary improvements continue to change the basic profile of the industry (*e.g.*, the adoption of the new Society of Automotive Engineers (“SAE”) Aerospace Materials Standard (“AMS”) toxicity limits); and
4. The limited number of technologies capable of being implemented within the 3-year ELG compliance period suggest a practical limit on the impact of withdrawal of the ELG.

II. IF THE AGENCY PURSUES PROMULGATION OF A DEICING ELG, IT MUST AT LEAST WITHDRAW THE PROPOSED RULE AND PROVIDE OPPORTUNITY FOR PUBLIC NOTICE AND COMMENT ON A NEW PROPOSAL

As discussed above, ATA believes law compels EPA to withdraw the Proposed Rule and delete the airport deicing industry category from the list of industries to be regulated under the 2004 EGP. Should the Agency continue to pursue development of a Deicing ELG, however, it must propose a new regulation providing the public with notice of and the opportunity to comment on the new regulation. The current Proposal is arbitrary and capricious, and, assuming promulgation of a valid Deicing ELG is even possible, the changes required and the amount of

information and analysis needed to support any regulation, including from the FAA, are so extensive that satisfaction of notice and comment requirements compels reproposal. At the very least, EPA should restart this process through a NODA.

A. It Would Be Arbitrary and Capricious to Proceed With the Proposed Rule Because It Does Not Meet the Standard for Reasoned Decisionmaking

As detailed in Section I, we believe the airport deicing category cannot properly be subject to an ELG. At a minimum, EPA must address the questions raised there before it can proceed. Moreover, as detailed in Part 2 of these Comments, there are numerous, fundamental flaws with the Proposed Rule. In the face of this, it would be arbitrary and capricious for the Agency to proceed under the framework of the current proposal.

Agency decision-making is constrained by and must satisfy the standards of the federal Administrative Procedure Act (“APA”), 5 U.S.C. §§ 701-06. Under the APA, Agency actions and conclusions that are “arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with the law,” or that are “in excess of statutory jurisdiction, authority, or limitations, or short of statutory right” are unlawful. 5 U.S.C. § 706(2); *see, e.g., American Coke and Coal Chemicals Inst. v. EPA*, 452 F.3d 930 (D.C. Cir. 2006) (reviewing ELG regulations under the arbitrary and capricious standard); *American Meat Institute v. EPA*, 526 F.2d 442 (7th Cir. 1975) (same). Where an agency “relied on factors which Congress has not intended it to consider, entirely failed to consider an important aspect of the problem, offered an explanation for its decision that runs counter to the evidence before the agency, or is so implausible that it could not be ascribed to a difference in view or the product of agency expertise,” its actions are arbitrary and capricious. *American Coke and Coal Chemicals Inst.*, 452 F.3d at 941, *quoting Motor Vehicle Manufacturers Ass’n v. State Farm Mut. Auto Ins. Co.*, 463 U.S. 29 (1983).

Furthermore, agency action must be supported by and connected to the administrative record. *American Petroleum Institute v. EPA*, 540 F. 2d 1023 (10th Cir. 1976) (“The grounds upon which the agency acted must be clearly disclosed in, and sustained by, the record. The agency must make plain its course of inquiry, its analysis, and its reasoning.”); *Grain Processing Corp. v. Train*, 407 F. Supp. 96 (S. D. Iowa 1976) *quoting Burlington Truck Lines v. United States*, 371 U.S. 156, 168 (1962) (“The agency must articulate a ‘rational connection between the facts found and the choice made.’”).

A short list of the various inadequacies of the Proposed Rule, includes, without limitation:

1. The Agency failed to consider adequately aviation safety, the highest priority for this industry (*see* Section IV);
2. The Agency failed to consider the potentially huge impacts on aircraft operations and the NAS, particularly with respect to large Northeastern airports (*see* Section V);
3. The Agency failed to make any reasonable estimate of costs to the industry – most tellingly, the Agency fails to apply the metrics and formulas correctly, leading it to underestimate capital costs by *about \$1.19 billion dollars and annual costs by nearly \$90 million* (*see* Section VI) and fails to account for

numerous elements that each alone could add hundreds of millions the estimates;

4. The Record does not support EPA's selection of Best Available Technology Economically Achievable ("BAT") standards for ADF Collection (either at Tier One airports or Tier Two airports; *see* Section VII);
5. The Record does not support the Agency's economic analysis of the industry (*see* Section XI);
6. The Agency violates the CWA by failing to promulgate or consider Best Practicable Control Technology Currently Available ("BPT") or Best Conventional Pollutant Control Technology ("BCT") standards (*see* Section XII(B)) and by designating COD as the regulated pollutant (*see* Section XII);
7. The Agency fails to consider adequately pollution prevention (*see* Section XIII) thus violating the Pollution Prevention Act ("PPA") and sound public policy; and
8. The analysis is replete with "explanation[s] . . . that run[] counter to the evidence before the agency, or is so implausible that [they] could not be ascribed to a difference in view or the product of agency expertise;" this results in part from a fundamentally flawed methodological approach (*see* Section XIII) which is manifest throughout the analysis.

Taken together, for the legal, practical and policy reasons cited throughout these Comments ATA submits that the Proposed Rule cannot presently meet this standard and falls well short of reasoned decision-making.

B. The Proposed Rule Needs Such Extensive and Fundamental Input from FAA that Re-Proposal or Publication of a Notice of Data Availability Subject to Public Comment Will Be Required

As further detailed throughout these Comments, there are significant operational and safety concerns raised by the Proposed Rule. The Record demonstrates that EPA has not had the benefit of significant input of the FAA on the appropriateness of any of the proposed regulatory measures, nor has there been any meaningful opportunity for the aviation industry or the public to provide comment on any views that the FAA might wish to offer. Thus, EPA must seek and incorporate into the record the detailed input of FAA, which then must be made subject to comment by interested stakeholders.

At the very least, EPA should restart this process through a NODA. If EPA follows this course, its analytical approach will need to be expanded to extend beyond the set of data points it has drawn from a very limited number of sites in order to address site-specific variability inherent in this industry in a meaningful and reasoned manner. Indeed, as more fully explained hereafter in these comments, should the Agency attempt to complete this rulemaking it is essential to reasoned decision-making that the regulation reflect and accommodate variability across the industry. So too, the Proposed Rule needs such fundamental and extensive revisions that it would violate notice and comment requirements for EPA to proceed without re-proposal or publication of a NODA subject to public notice and comment.

III. SPECIFIC ISSUES THAT MUST BE ADDRESSED

As noted above, ATA believes that this rulemaking cannot be completed consistent with the Federal Aviation Laws, the APA, and the CWA. Any attempt to restructure the rule to account for these structural and legal impediments must be so sweeping as to demand re-proposal, although our expectation is that even that effort ultimately would be unsuccessful given the unprecedented complexity of airport deicing and the conflicting demands of the CWA and the federal laws governing commercial aviation.

However, if the Agency disagrees and continues the effort to develop a Deicing ELG, there are several specific issues that emerge from the Proposed Rule that the Agency must address to have any possibility of successfully promulgating a legally sustainable and rational regulation. In that limited context, we offer the comments below, identifying specific deficiencies and opportunities for improvement in the Proposed Rule. While resolving all of these issues may render the Proposed Rule less objectionable, we doubt it can eliminate the more fundamental problems identified above. However, as presented below, we identify (without recommending) approaches that might be taken to resolve some of these issues. Further, we commit to cooperate with the Agency in good faith efforts to address these issues.

A. Develop New Subcategory for Site-Constrained Tier One Airports

One of the central deficiencies in the Proposed Rule is failure to acknowledge and address the absence of Record support for the proposition that CDPs can in fact be deployed at airports where BAT requires their deployment. As discussed above, the only technology EPA purports to have demonstrated as capable of achieving the Tier One collection standard is “centralized deicing pads.” As a result, based on EPA’s own Record, there is no demonstrated alternative but for all aircraft deicing at Tier One airports to take place on CDPs.³¹

However, there is no definitive statement in the Record that Tier One airports in fact have sufficient and appropriate locations to site pads capable of handling 100% of departures, including the airport’s peak hourly departure rate. Rather, EPA speaks to this issue in terms that are, at best, equivocal. In the Notice, EPA says that it “finds that the proposed BAT technologies are *generally available* to be installed or used by those in the industry;”³² fourteen lines below that statement EPA asserts that it has found each of the four options in Table VII-2 (“ADF Collection Technology Options Considered for BAT”) is “*widely available*.”³³ Generally available or widely available, however, is not “available.” The statement immediately following this assertion is the closest the Agency comes to making a definitive statement: “EPA finds that for the [Tier One airports], collection of ADF based on the use of deicing pads is technologically available.”³⁴ This statement, while it may be intended to be so interpreted, does not

³¹ Again, there is a very limited exception for “deicing for safe taxiing.” There is no exception for “deicing for safe flight.”

³² Notice at 44692, col. 1.

³³ Notice at 44692, col. 1.

³⁴ Notice at 44692, col. 1.

unequivocally state all Tier One airports can deploy CDPs of sufficient size and quantity to accommodate all aircraft deicing operations demanded at the airport – only that CDPs may be deployed at the airports in the limited, and effectively meaningless, sense that “a CDP or CDPs of some sort could be deployed.”

In fact, the analysis EPA intended to identify in the Notice as establishing that “constrained airports have sufficient land to install the necessary collection technologies,”³⁵ only claims that the “analysis *indicates* that even space limited airports can install some combination of deicing pads as one option *to help achieve the target capture* and control percentage for spent ADF.”³⁶ Even this conclusion is grounded on derivation of “conceptual” pad locations the actual feasibility of which cannot be ascertained because, the analysts acknowledge, they lacked “sufficient information” to do so.³⁷ We will not repeat here our extensive discussion regarding the deficiencies of this analysis (*see* Section VII(A)), but in this context it is important to emphasize that the analysis is based on extrapolations of data on the size of three airports, PIT, DIA and DTW. None of these airports deploy CDPs to the exclusion of other technologies to collect ADF. In addition, none of the airports EPA uses to “estimate” the collection efficiency of CDPs relies exclusively on CDPs to collect ADF (*see* Section VII(A)) and the Agency does not conform the collection standard to the characteristics of the pad collection systems upon which it basis its estimate.

In short, there is no credible evidence in this Record that the proposed *Best Available* Technology for Tier One ADF collection is in fact available. Absent such evidence the selection of CDPs as a model collection technology and the proposed BAT for ADF Collection at Tier One airports upon which it I based, cannot stand. Indeed, ATA is confident that siting CDPs of sufficient number and size (together with their necessary appurtenances) to handle 100% of the scheduled departures at EWR, LGA, JFK, BOS, and perhaps at other airports will prove impossible.³⁸

ATA appreciates the difficulty of this issue. Even within the aviation community, decisions about airfield modifications present complex questions depending upon the evaluation of interdependent safety, operational and regulatory issues including, but not limited to, their

³⁵ Notice at 44692, col. 1.

³⁶ Document - 1171 at 3 (emphasis added).

³⁷ Document - 1171 at 2.

³⁸ While EPA might note in response that the Preamble makes mention of Fundamentally Different Factors (“FDF”) variances, we note that such variances cannot properly substitute for complete and competent rulemaking. The issue of site-constraints that limit the availability of CDPs at Tier One airports has been squarely raised, by EPA and now by ATA, and it cannot be deflected simply by noting a potential mechanism designed to address site-specific factors that EPA inadvertently overlooks in ELG rulemakings. Moreover, relief under the FDF mechanism is not available as the Record is currently configured. Such relief depends upon the Agency having failed to consider a factor that renders one site different from others covered by an ELG. Here the Record reveals that EPA has considered in depth, albeit without satisfactory resolution, the question of centralized pad availability at Tier One airports. With that issue squarely before the Agency, it would seem inappropriate to suggest that adequate relief is available through the post-rulemaking FDF variance process.

effect on NAS. Airlines, airports and the FAA often come together to resolve these complex questions, and it is this kind of cooperative application of expertise that ATA believes might be of value in resolving the question of centralized pad availability at Tier One airports.

Given that the Proposed Rule cannot move forward until a way is found to address the availability of centralized deicing pads at Tier One airports, EPA should establish a working relationship with appropriate offices at the FAA and with key airline and airport stakeholders, to identify those Tier One airports that in the expert opinion of the FAA cannot realistically employ EPA's model collection technology for reasons of land availability or operational continuity. Based on these consultations, EPA could place those airports into a separate subcategory and, again with the help of the FAA and the industry, identify an appropriate model collection technology capable of application at those airports without impinging unacceptably on safety or operational continuity. That subcategory and its revised model collection technology could then be included in a re-proposal or a NODA and subjected to review and comment by the public.

We at ATA look forward to discussing this approach with EPA and, as appropriate, with the FAA.

B. Develop Alternative Minimum Threshold for Tier Two Airports

EPA has requested comment on the development of an alternative minimum threshold criteria for the scope of the rule "such as the amount of ADF used, or number of deicing operational days."³⁹ ATA has evaluated the airport and associated ADF usage data and agrees that a new minimum threshold criteria should be established to account for airports that experience infrequent or frequent-but-inconsequential deicing events. The development of a minimum threshold for inclusion in the rule would have minimal impact on the benefit of the rule because analysis of the usage data indicates that those airports that would be Tier Two but are not currently collecting 20% of available ADF only account for 1.7% of the ADF usage nationwide. Airports that would be excluded based on a reasonable minimum threshold, therefore, would account for only a small fraction of the rule's expected benefits.

ATA believes that EPA would be justified in setting this new minimum threshold at an Annual Normalized ADF usage⁴⁰ of 90,000 gallons. Airports below this minimum threshold would become Tier Three airports subject to pavement deicing standards but not to the ADF collection and treatment standards created by the ELG. This suggested threshold is based on (1) the minimal contribution of ADF at these airports and the associated limited benefit of applying this rule to airports with usage less than 90,000 gallons per year, while retaining the much larger benefits associated with the Pavement Deicer BAT to which they would remain subject; (2) differences in departures and deicing event frequencies at these airports; and (3) the uncharacteristically high economic burden associated with measures required to address infrequent or inconsequential ADF usage. These factors reflect the process, engineering cost and

³⁹ Notice at 44714.

⁴⁰ Determination of whether this threshold is exceeded would, as under the Proposed Rule, be "calculated over the five year period prior to the submittal of a permit application or NOI." Proposed § 449.2 (definition of "Annual Normalize ADF Usage").

affordability factors required to be taken into account in the development of an ELG.⁴¹ They thus provide a sound basis for differentiating airports above the suggested threshold from those below. Technical support for this recommendation is provided below.

Of the Tier Two airports that use less than 90,000 gallons of ADF annually only 12 (representing 16.88 airports in the Airport Impact Model) would be required to implement collection and treatment technologies to comply with the rule. Together these airports account for only 1.7% of the ADF usage (weighted) nationwide and less than 2% of the COD removal attributed to the rule. These 12 airports are: BET, BHM, FWA, GSO, JNU, OKC, OME, ROA, SAT, ONT, OTZ and XNA.

The annual use of aircraft deicing fluid at any airport is a function of both the number and type of deicing events and number of departures. EPA recognized this relationship when it developed a metric for estimating ADF usage for airports at which empirical usage information was not available. In developing that metric, EPA defined departures as the total of all jet and non-jet departures. While EPA recognized that smaller commercial non-jet aircraft typically suspend flights during icing conditions,⁴² it chose not to differentiate jet from non-jet departures for the purpose of estimating fluid usage.

In fact, as EPA has recognized, it is clear that jet and non-jet departures are not equally likely to occur during deicing events. When airline operations are reduced as a consequence of a deicing event larger jet aircraft are generally given preference and that typically is accomplished first and preferentially through the cancellation of non-jet operations. Detailed analysis of the operating data for the surveyed airports indicates that the ADF Factor, recalculated as the product of annual jet departures and the snow or freezing precipitation (“SOFP”) days, becomes a better indicator of ADF usage than the ADF Factor defined as the product of all departures.

Analysis of jet and non-jet departures for this small group of airports indicates that non-jet operations account for a disproportionately large share of total operations when compared to other airports in Tier One and Tier Two. In the small group, 34% of the total annual departures are non-jet on average.⁴³ This contrasts with Tier One airports, at which only 8.6% of operations are non-jet, and Tier Two airports, whose non-jet operations comprise only 9.8% of total operations.⁴⁴ This difference in the ratio of jet to non-jet operations reflects a concrete process distinction between airports above and below the 90,000 gallon line.

Analysis of the “Jet ADF Factor” (defined as the product of annual jet departures and SOFP) indicates that the factor for Tier Two airports with usage between 90,000 and 460,000 gallons of normalized ADF is significantly different than the ADF Factor for airports with usage less than 90,000 gallons. Thus, within the existing Tier Two airports, there exists a sub-group of

⁴¹ See 33 U.S.C. §§ 1314(b)(1)(B), (2)(B) and (4)(B).

⁴² TDD at 13-2.

⁴³ Note that this average is heavily weighted with the Alaskan airports in which non-jet operations account for 70% of all operations on average.

⁴⁴ While the difference between jet and non-jet departures is significant for the Alaskan airports, other Continental US airports may also have a high percentage of non-jet operations (*e.g.*, FWA has 18% non-jet and ROA has 34% non-jet operations).

airports characterized by either infrequent deicing events with a ‘relatively’ high number of jet departures or frequent deicing events consisting of limited deicing of a few aircraft. In either case, airports in which less than 90,000 gallons of ADF are applied annually on average are different from other Tier Two airports and should be considered separately.

It is recognized that the type of storm event (snow, ice, sleet, freezing rain) will impact collection efficiency. This fact further differentiates Alaskan airports, which make up a substantial fraction of the sub-90,000 gallon airports impacted by the rule. Due to the long periods of below freezing temperatures, the runoff characteristics of the storm events are substantially altered and deicing materials are not available for collection (due to lack of runoff) and are encapsulated within the snow.⁴⁵ Thus, for these airports, collection strategies must be significantly different than airports located within the lower 48 states. This, too, represents a concrete process and engineering distinction that can be taken into account in establishing ELG thresholds.

These factors (different weather conditions, low usage of ADF) are also expected to impact the viability of anaerobic fluidized bed (“AFB”) treatment at these stations. Specifically, influent COD loads estimated for AFB treatment systems at these airports range between 30 and 1318 lbs per day with an average of 692 lbs per day. On average, the influent COD loads at for these airports are five times less than those at CAK and even the largest system is one-half the size of CAK. In addition, half of these airports are expected to install AFB treatment systems with expected influent loads of approximately 500 lbs COD per day or less. At these low loading rates (<15% of the CAK system), design engineers will require pilot testing to facilitate vessel sizing. If pilot tests are not conducted, then design engineers are likely to size systems similar to existing facilities (CAK and ALB) thereby forcing system operators to store stormwater until a sufficient volume is collected to minimize multiple start/stop cycles. This operating strategy (storage of stormwater) will promote the degradation of stormwater within holding tanks and result in sub-standard performance.⁴⁶

Relative cost impacts also differentiate Tier Two airports above and below the 90,000 line. Using EPA’s estimates, costs imposed on the few airports that apply less than 90,000 gallons of ADF but will require capital investment are out of proportion to costs imposed on airports applying greater than 90,000 gallons of ADF annually. Under the Proposed Rule the 12 identified airports (which represent 16.88 statistical airports in its models⁴⁷) are estimated to result in an ADF related weighted COD reduction of 872,330 pounds⁴⁸ at a weighted annualized cost of \$7,832,780.⁴⁹ This results in an average cost per pound of ADF-related COD removal of

⁴⁵ Document - 0077, answer to Q14.

⁴⁶ Arendt T. and J. Prior. July 8 2009. ACI-NA/ATA/RAA Deicing Management Conference. Akron-Canton Airport Deicer Management System North Canton, Ohio

⁴⁷ Eight of the airports are assigned a statistical weight of 1.0; four have statistical weights greater than 1.0, meaning they represent themselves plus other (or portions of other) modeled airports (these airports and their weights are: BET, 2.841; FWA, 1.968; ROA, 2.192; and XNA, 1.880).

⁴⁸ TDD Table 10-6 (calculated applying statistical weights to values found in this table).

⁴⁹ TDD Table 11-1.

\$8.99 per pound. EPA suggests that under the Proposed Rule the cost per pound of pollutant removed is \$2.02⁵⁰ - thus the average cost per pound of ADF-related COD removed is more than four times higher. In comparison, average cost per pound of ADF related COD is \$3.11 per pound and can be further broken down to a cost of \$2.90 per pound of ADF-related COD for the top 14 airports and \$4.66 per pound of ADF related COD for the remainder of the airports. Thus, costs for these airports is nearly 2 times higher than other Tier Two airports and more than 3 times higher than the cost borne by the top 14 airports. Indeed, these airports would account for 8.6% of the total cost of the rule but only account for 1.9% of the COD removed.

Not only do these airports bear a disproportionate share of the costs, but they also are more likely to have significant revenue impacts (applying EPA's significance criteria). Table 5-5 of the EA⁵¹ provides a list of the top 8 airports with cost as a percentage of operating revenues greater than 3%.⁵² Of these airports, 5 of the airports are in the class of airports that apply less than 90,000 gallons of ADF per year. These airports are JNU, ROA, FWA, GSO and XNA.⁵³ Taking airport weighting into consideration shows that over half of the sub-90,000 gallons impacted airports would exceed the 3% cost to total operating revenue value. Further, well over half of the sub-90,000 gallon impacted airports have predicted removal costs (\$/lb of COD removed) in excess of \$6.90 per pound of ADF-related COD. Thus, not only do the airports applying less than 90,000 gallons of ADF pay more per pound of COD removal, but these costs also are more likely to exceed EPA's criterion for cost acceptability. Notably, in justifying the 10,000 total departure cutoff for Tier Two EPA noted that airports below that line would incur "costs of about \$6.30/lb, almost three times the cost effectiveness of the proposal."⁵⁴

Finally, as discussed in Section V, of these comments, EPA has significantly underestimated the cost for AFB systems at these small airports by failing to: 1) consider that the cost per pound of COD will increase as the estimated daily loading decreases; and 2) account for the 'cost of entry' to design and install an AFB treatment system. In fact, data from the two

⁵⁰ This cost effectiveness figure is misleading because it is calculated by taking the ratio of the costs and pounds removed attributable to combined compliance with: (a) ADF Collection and ADF Treatment BAT; and (b) compliance with the BAT for pavement deicers. The cost of compliance with BAT for pavement deicers (urea substitution) is estimated to be about 6% of the costs of compliance but account for nearly 40% of pounds of pollutants removed. We note that if the threshold for Tier Two airports was adjusted as suggested, airports with <90,000 Annual Normalized ADF Usage would remain subject to the Tier Three requirement to substitute urea and the associated pollutant removals; as a result 7,289,437 million pounds of urea-related COD and Ammonia would still be removed (Document - 0631). Stated another way: the vast majority environmental benefits associated with those airports in Tier Two with <90,000 Annual Normalized ADF Usage would be retained.

⁵¹ EA at 5-8

⁵² EPA used this approach in selecting among its four identified BAT option packages. Notice at 44705, col. 3 ("[O]f those airports that would incur costs under today's proposal, 5 of the first 6 airports that immediately follow the top 14 by ADF usage would be projected to incur costs greater than 3 percent of revenues and therefore would incur a heavy economic burden"). See also EA at 5-26.

⁵³ TDD Table 13-2 indicates that 11 airports have cost to revenue ratios > 3%, however, the airports are not identified.

⁵⁴ Document - 1099 at 15.

model airports can be utilized to estimate the cost of entry at \$2,000,000 for an AFB system. In comparison, EPA estimated the capital cost of an AFB system at BET to be \$110,478⁵⁵. Clearly this is insufficient for the design, acquisition and construction of a complex treatment system which has the potential to generate large quantities of an explosive gas. As noted above, many of these small airports have cost to total operating revenue ratios in excess of 3%. Accounting for the increased cost of small AFB treatment systems will only increase the cost to revenue ratios to unacceptable levels for this limited group of small airports.

The airports that apply less than 90,000 gallons of ADF annually and which will be required to implement collection technologies to capture 20% of the available ADF would result in the reduction of approximately 870,000 lbs of COD representing approximately 1.95% of the COD removed by the rule. Cost for this is approximately \$7.8 million dollars representing 8.6% of the cost of the rule. The average cost for removal for these sub-90,000 gallon impacted airports is \$8.99 per pound of COD removed and is nearly four times the cost effectiveness of the proposed rule. Over half of the airports impacted will have costs in excess of \$6.90 per pound of COD applied and half of the airports will have costs to total operating revenues in excess of 3%. As shown above, these small users are significantly different in their operations as defined by the differences in their Jet ADF Factor compared to other Tier Two airports, have a higher percentage of non-jet operations and are expected to account for an inconsequential fraction of the total reduction in ADF discharges attributed to the rule. The imposition of this rule on these airports will add yet another operation which will further compromise airport safety and operations during infrequent and atypical deicing events. Alternatively, this rule imposes collection requirements at airports (i.e., Alaska) in which it is unlikely that ADF runoff can be collected (due to lack of runoff). As EPA found in the justification of the 10,000 total departures cutoff⁵⁶, airports with less than 90,000 of Annual Normalized ADF usage⁵⁷ should be re-characterized as Tier Three airports for these process, engineering, cost and affordability reasons.

C. Collection Standard

1. Eliminate Permit Writer Authority to Dictate Collection Technology and Means of Documenting Compliance with Collection Standard

The Proposed Rule affords permit writers the authority to dictate collection technologies and the means by which individual facilities demonstrate compliance with the proposed collection standard. In both cases, that authority must be eliminated in any final rule.

⁵⁵ Document - 0634, Column FB.

⁵⁶ Document -1099 at p. 15.

⁵⁷ As with determinations of Tier One/Tier Two status, determinations whether an airport is over or under the 90,000 gallons of Annual Normalized ADF usage should take into account the benefit of pollution prevention measures, including the use of low-BOD/COD ADFs.

a. **Proposed Section 449.20(b)(2)(i)(A)**

Proposed Section 449.20(b)(2)(i)(A) provides that “. . . the Director, on a case-by-case basis, may require: (A) The use of a different ADF collection technology from the technologies specified in paragraph (b)(1) of this section; . . .” This delegation of authority is impermissible.

EPA has long been clear that an ELG that imposes numeric standards does not dictate technology choices, but rather establishes performance standards that the regulated community may meet by means of its own choosing.⁵⁸ In addition to violating this precept of the ELG Program, the proposed language also purports to authorize permit writers to dictate that specific airfield modifications be performed, placing those permit writers’ authority squarely in conflict with the FAA’s primary and exclusive jurisdiction over the NAS. Finally, permit writers, however well intentioned, are simply not competent to dictate which ADF collection technologies are to be employed by the aviation community and, if they were, the absence of any standards in the ELG limiting their discretion would render this purported delegation of authority an abdication by EPA of its obligation to develop a substantive rule.

For all of these reasons, EPA should revise the language of § 449.20(b)(2)(i)(A) to clarify that permit writers do not have authority to dictate an airport’s or airline’s choice of technology used to comply with collection standard.

b. **Proposed Section 449.20(b)**

Similarly, Proposed Section 449.20(b) provides that “. . . *the Director* shall select one of the following three methods and specify it in the permit as the required method for the permittee to demonstrate compliance with the percent capture requirements in §449.10 or §449.11 as applicable.” This delegation of authority also should be eliminated.

First, the choice of demonstration method may be indistinguishable from a directive to use a specific technology if the permit writer selects the methodology described in Proposed § 449.20(b)(1) (use of GRVs or centralized deicing pads, depending upon the Tier of the airport). As described immediately above, neither EPA nor the permit writer has the power to dictate how a discharger complies with a numeric standard.

Second, and more practically, it is the airport and its tenant airlines that are in the best position to determine which demonstration method best suits their needs. In some cases, an empirical approach might be simplest where data on ADF usage and capture can be readily collected. In other cases, the “deemed to comply” method in § 449.20(b)(1) or the tailored technical specifications available under § 449.20(b)(2) may be preferable. Affording the permit holder the opportunity to select the demonstration method of its choice allows these preferences to be honored. Moreover, allowing permittees to elect which method to use in no way reduces

⁵⁸ This longstanding position is reiterated in the Preamble to this rule. Notice at 44690, col. 1 (“As is the case for any effluent guideline containing numeric effluent limitations, a facility would be able to use any combination of wastewater treatment technologies and pollution prevention strategies at the facility to meet effluent limitations.”).

the permit writer's authority to establish specific documentation requirements necessary to ensure that the permittee's demonstration is credible.

For these reasons, EPA should modify Proposed § 449.20(b) to state that the permittee shall elect which of three documentation techniques shall be specified in the permit.

2. Conform Standards to Record Data

A central tenant of administrative law is that a rule must be supported by its record, and that the content of the record defines the content of the rule. There are at least two respects in which EPA should clarify its statement of the proposed collection standards to ensure that the ELG is consonant with the record here.

a. Clarify Period Over Which Compliance with Collection Standard Must be Demonstrated

First, the Proposed Rule provides permit writers with no guidance as to the period over which an airport must achieve the compliance with the collection efficiency standard. EPA acknowledges that model collection technologies achieve significantly different collection efficiencies in different storm events and even year-to-year. Because the values deemed to be representative of the two model collection technologies (60% and 20%) are not the low ends of the ranges for each model collection technology, the standards must reflect this documented variability. If they do not, facilities could be forced to attain collection efficiencies higher than those demonstrated to be achievable through use of the model technologies if the compliance period were not sufficiently long to allow that variability to be expressed.

There are two approaches available to the Agency to address this problem. On the one hand, it could modify the Proposed §§ 449.10(a)(1) and (2) to include suitable durations consistent with the Record. On the other, it could revise the numeric collection standards contained in those two sections downward sufficiently to reflect lowest documented collection efficiency of each model technology.

b. Require Permit Writers to Accept Compliance Demonstrations Consistent with Those on Which BAT Collection Standards Are Based

Similarly, it is imperative that permit writers implementing any final ELG allow permittees to demonstrate collection efficiency in the same manner as have the airports upon whose data EPA relies to establish its collection standard. At a minimum this must include allowing deicing collection facilities that do not meet EPA's constrained definition, but which EPA relied upon to derive the BAT ADF Collection standard for Tier One airports, to qualify for purposes of Proposed § 449.20(b)(ii).

The technical specifications of Proposed § 449.20(b)(ii) must be modified in at least two important respects. First, the use of the term "centralized deicing pad" is itself confusing and potentially overly constraining. In Advisory Circular ("AC") 150/5300-14B, *Design of Aircraft Deicing Facilities*, FAA defines "centralized deicing facility" as "an aircraft deicing facility located at the terminal gates/aprons or along taxiways serving departure runways;" and "remote

deicing facility” as “an aircraft deicing facility located along taxiways serving departure runways or near the departure end of runways.”⁵⁹ In addition, the Notice suggests that a CDP can only be “a facility . . . built specifically for aircraft deicing operations.”⁶⁰ Whatever term EPA adopts to refer to the required facility, it must be made clear that any facility that meets the proposed collection standard at least encompasses the facilities included in FAA’s definitions of “remote deicing facilities” and “centralized deicing facilities.” In addition, EPA must clarify that such facilities may be used for other purposes when not used for deicing operations. This is essential given that efficient use of all available pavement to accommodate operations is at a premium for all airports, but especially land-constrained airports and the deicing season at the vast majority of airports (and all potential Tier One airports outside of Alaska) is half a year or less, and deicing events are the exception rather than the rule even during deicing season. In addition, airports may have taken advantage of existing infrastructure (e.g., drainage systems, pavement areas used for other purposes) to capture ADF – EPA must clarify that such facilities may qualify under Proposed § 449.20(b)(ii).

Second, the design specifications touching on safety must be dropped. We discuss the “deicing for safe taxiing” limit in detail below. The “peak hour,” “minimum width” and “minimum length” requirements in subparagraphs (D) to (F) are not within EPA’s authority to dictate and, in any event, add nothing given that all such facilities must meet the exacting specifications set out in AC 150/5300-14B.

So too, computations utilizing different parameters or different methodologies could easily produce performance metrics that are more or less stringent than those supported by the Record. A final ELG cannot allow its substantive collection standards to vary based on the use of compliance calculations inconsistent with the performance demonstrations contained in the Record. A remedy would be to modify Proposed §§ 449.20(b)(2) and (3) to require permit writers to accept compliance demonstrations consistent with those in the Record upon which EPA relied when setting the collection standards in the first instance. This might be accomplished by providing illustrative calculation or by enumerating acceptable demonstration practices consistent with those in the Record upon which the proposed collection standard is based. If permit writer and permittee agree to an alternate form of compliance determination, of course, the permit writer should be authorized to employ that methodology as well.

3. **Pollution Prevention**

The Proposed Rule takes insufficient account of the potential benefits of pollution prevention techniques and focuses instead on collection and treatment systems that require

⁵⁹ Document - 0741 at 1; EPA also specifically listed AC 150/5300-14B as one of several FAA has issued dealing with deicing issues in the Notice at 44682, col. 1. “Aircraft deicing facility” is defined as:

A facility where -- (1) frost, ice, slush, or snow is removed (deicing) from the aircraft in order to provide clean surfaces, and/or **(2)** clean surfaces of the aircraft receive protection (anti-icing) against the formation of frost or ice and accumulation of snow or slush for a limited period of time (referred to as the “holdover time”).

⁶⁰ Notice at 44686, col. 3.

continued, substantial use of glycol-based ADF products.⁶¹ While the Agency generally may be free to rely upon any model treatment technology that it can support, it nonetheless is obliged by law to consider the impact of proposed rules such as this on source reduction efforts, and to craft those rules to facilitate the adoption of source control technologies where available and, at a minimum, to avoid penalizing facilities that elect to use such alternative technologies to achieve compliance with the rule's standards. In fact, the Agency acknowledges that it "is proposing this regulation under the authorities of . . . the Clean Water Act . . . and pursuant to the Pollution Prevention Act of 1990, 42 U.S.C. 13101 *et seq.*"⁶² Beyond its legal obligation to enable pollution prevention practices, EPA recognizes that effluent guidelines are unique in that "[u]nlike other CWA tools, effluent guidelines provide the opportunity to promote pollution prevention . . ."⁶³ We are confident that the Agency recognizes the facilitation of these alternatives to pollution generation as good public policy.

Source reduction technologies and practices have been and continue to be important tools for the reduction of ADF discharges from aircraft deicing. EPA catalogued many of these in its TDD,⁶⁴ including blend-to-temperature systems; forced air and hybrid deicing trucks; new, lower-toxicity deicing products; and one new Type I ADF that employs 1,3-propanediol rather than propylene glycol as its freezepoint depressant.⁶⁵ Progress in this arena is so active, however, that another ADF has entered the market since the TDD was prepared: Octagon's EcoFlo Type I fluid, which exerts 25-35% less oxygen demand.⁶⁶ This product is already being used by an ATA airline at BOS, LGA, BWI, IAD, and EWR, and is being tested by other ATA airlines. In addition, testing has commenced on new ice-phobic wing coatings with the potential to drastically reduce the need for any form of ADF.⁶⁷ Following on the heels of industry-led efforts to develop the virtually non-toxic Type I fluids that now dominate the market, these continuing advances demonstrate this

⁶¹ The benefits of pollution prevention, the steady and continued progress made by this industry to foster and expand pollution prevention opportunities, including the development of environmentally friendly deicing products, and the relationship between certain pollution prevention practices and the efficiency of the model collection technologies are described in detail in [Section VIII] of these Comments.

⁶² Notice at 44,677, col. 2. The PPA affirmatively establishes as a national policy of the United States that "pollution should be prevented or reduced at the source whenever feasible." To this end, the Act directs EPA "to develop and implement a strategy to promote source reduction," (42 U.S.C. §13103(b)), to "ensure that the Agency considers the effect of its existing and proposed programs on source reduction efforts and . . . review regulations of the Agency prior and subsequent to their proposal to determine their effect on source reduction," (42 U.S.C. §13103(b)(2)), and to "facilitate the adoption of source reduction techniques by businesses" (42 U.S.C. §13103(b)(5)).

⁶³ *Technical Support Document for the Preliminary 2010 Effluent Guidelines Program Plan* at 1-2 (October 2009).

⁶⁴ TDD at Section 8.3.

⁶⁵ This is Kilfrost's DF Sustain Type I ADF.

⁶⁶ The degree of reduction in oxygen demand depends on whether BOD or COD is the measure. Not insignificantly, the product also is free of triazoles and nonylphenol ethoxylate ("NPE") surfactants. See product information available at: http://www.octagonprocess.com/products_ecoflo.html?cache=1.

⁶⁷ ATA understands that NuSil will provide comments detailing its progress in testing and bringing its ice-phobic coatings to market.

industry's commitment to and success at developing workable pollution prevention technologies. In order to maintain this impressive progress, it is critical that any final ELG at least place those existing and evolving practices on an even footing with its traditional model collection and treatment technologies. Otherwise, the ELG will stand as a disincentive to the significant investments necessary to achieve pollution prevention and, inadvertently, will reward decisions to backslide into technologies that are dependent for their operation on continued high levels of glycol usage.

The Proposed Rule requires modification in two specific respects to ensure that it appropriately encourages and credits the use of pollution prevention technologies. First, the proposal's three approved techniques for demonstrating compliance with the collection standard must each require consideration of the benefits of pollution prevention practices. Second, a final ELG must include enforceable guidance to permit writers describing the factors that need to be taken into account when calculating appropriate credit for pollution control practices. We describe each of these shortcomings in more detail and offer suggestions to correct them in a final rule.

a. **Require Credit for Pollution Prevention under All Demonstration Techniques**

Consideration of the effect of pollution prevention practices would not be authorized under Proposed §§ 449.20(b)(1) and (3), and would be left to the permit writer's discretion under Proposed § 449.20(b)(2). As written, the Proposed Rule is not consistent with the Agency's explanation of the intended effect:

As is the case for any effluent guideline containing numeric effluent limitations, *a facility would be able to use any combination of wastewater treatment technologies and **pollution prevention strategies*** at the facility to meet effluent limitations.⁶⁸

We agree that this should be the effect of any ELG, but it is not the effect of the ELG as proposed. Airports would not be able to use pollution prevention strategies except under Proposed § 449.20(b)(2) and only then solely at the permit writer's discretion. Thus, §§ 449.20(b)(1), (b)(2)(C) and (3) must be modified to require permit writers to consider pollution prevention measures and provide appropriate credit towards compliance with the collection standard.⁶⁹

b. **Identify Factors that Permit Writers Must Consider to Reasonably Account for Benefits of Pollution Prevention Practices**

⁶⁸ Notice at 44690, cols. 1-2 (emphasis added).

⁶⁹ Appropriate credit for pollution prevention should, of course, also be provided when making any determination based on a threshold expressed in terms of ADF usage, including credit for the adoption of low-BOD/COD ADF products.

To ensure regulatory consistency and fairness, EPA must provide binding, unifying guidance to permit writers regarding pollution prevention in the body of the ELG. Factors such as the performance characteristics of individual pollution prevention measures, the circumstances that affect their efficiency of operation, their impact on the model collection technologies where those are in use -- all of these are complex subjects that will be foreign to most permit writers but about which EPA has learned a great deal in the course of this rulemaking. Requiring a hundred or more individual permit writers to replicate EPA's learning and then setting them off without guidance to calculate pollution prevention credits will lead to regulatory inconsistency and unfairness. In addition, it would result in an ELG that is anything but nationally uniform in its application, a result inimical to the CWA and ELG program. These outcomes are unacceptable to both the Agency and the aviation industry.

One possible solution is for the Agency to incorporate guidance in the ELG itself that provides permit writers with a common starting point as they calculate the benefits of pollution prevention practices. ATA of course recognizes that site-to-site variations among airports may make it difficult to develop a rigid formula that appropriately recognizes pollution prevention practices in all locations. We are, however willing to work with EPA to evaluate such a formula if that is the Agency's preference.

An alternative approach may be to include a list of the key factors that should be a part of any calculation of pollution prevention credits. While not as definitive as a formula, these factors could help to make permit writers aware of key issues and require that they reasonably consider those issues as they determine the quantum of credit, if any, merited by a given suite of pollution prevention measures. Such factors might include:

- The range of performance expected of the pollution prevention measure, and the data sources available for estimating actual performance at a particular site;
- Savings, if any, in total anticipated ADF discharge (or its BOD/COD equivalent) as a result of the pollution prevention practice;
- Consider use of BOD/COD equivalent of ADF thresholds to account for future adoption of low-BOD/COD fluids;
- Establishment of a baseline year or condition against which to measure pollution prevention benefits (2005 conditions may be appropriate given that was the last year from which EPA collected data in support of the Proposed Rule); and
- The impact, if any, of the pollution prevention measure on any other collection technologies in use, along with an appropriate means of adjusting the collection standard to account for such effects.

4. 25 Gallon Safe Taxiing Exemption

Sections 449.20(b)(1)(i)(A) and 449.20(b)(1)(ii)(B) of the Proposed Rule each establish a 25 gallons of ADF as the maximum allowed to ensure safe taxiing. According to the preamble:

This volume is based on a current requirement at Denver International Airport. EPA requests comment on whether this is the appropriate ADF amount.⁷⁰

The Agency's definition of "deicing for safe taxiing" acknowledges that deicing is sometimes required to "prevent damage to a taxiing aircraft," implicating the safety imperatives and also potentially significant economic consequences that must be taken into account before imposing such a limit.⁷¹ The proposed limit must be eliminated.

First, EPA here directly dictates procedures for aircraft ground operations. The Agency has no such authority. In fact, EPA acknowledges that ultimately it is the pilot-in-command that must determine whether an aircraft has been deiced adequately to allow its safe operation:

While the FAA has issued regulations and guidance on conducting deicing/ anti-icing operations, the aircraft pilot is ultimately responsible for determining whether the deicing performed is adequate. The pilot may inspect the aircraft after deicing and order additional deicing or anti-icing.⁷²

Dictating a maximum amount of ADF to be used for pre-taxi deicing in an ELG impinges directly on the FAA's primary and exclusive jurisdiction over safety, which in this instance it has entrusted to the pilots in command. EPA simply has no authority to and cannot regulate ADF usage in this manner.

Second, the proposed limit would effectively eliminate any aircraft departures which cannot operate because 25 gallons of ADF is inadequate to clear engine intakes and other critical areas for safe taxiing. No airline would compromise safety, or suggest that its pilots in command compromise flight safety by taxiing an inadequately deiced aircraft. Thus, if the pilot in command of a flight requiring pre-taxi deicing concludes that his or her EPA-allotted 25 gallons of ADF has not sufficiently cleared the aircraft's engine inlets and other taxi-critical areas that flight simply will not operate. EPA has no authority to affect aircraft operations in this manner.⁷³

⁷⁰ Notice at 44714, col.3.

⁷¹ Proposed § 449.2 (definition of "*Deicing for safe taxiing*").

⁷² Notice at 44683.

⁷³ We note that even if Congress were to grant EPA authority to establish an enforceable limitation on the amount of ADF used prior to taxiing, the Agency could not do so without accounting for of the number and financial impact of the flights canceled where its proscribed practice was insufficient to ensure the safety of the flying public. In addition, a single example of an airport-imposed regulation cannot possibly

The Record here also establishes the need, in the event the Agency attempted to provide any guidance regarding ADF usage, to ensure safe taxiing must always give way to FAA safety regulations and that any such guidance should be based on airport-specific conditions.⁷⁴ Climatic conditions at airports in the Midwest, Alaska and on the East Coast differ greatly from those at DIA: any “deicing for safe taxiing” guidance established at DIA cannot form a reasonable basis for application to airports in other regions of the country. In addition, cargo aircraft sometimes experience layovers in excess of 24 hours, potentially increasing the snow/ice that must be removed to achieve compliance with FAA regulations. Moreover, the Record is clear that any such “limitation” on fluid use is subject to exceptions to ensure FAA safety regulations are followed and that aircraft operations are not significantly compromised. As pointed out below, even the DIA NPDES permit allows full deicing off of the CDPs under such circumstances. (See Section IV(B)).

For these reasons, EPA must modify Proposed § 449.20(b)(1)(i)(A) to eliminate the 25-gallon limit and simply state that “all deicing activities with the exception of “deicing for safe taxiing” (as defined) shall take place in an area . . .,” and must delete Proposed § 449.20(b)(1)(ii)(B). While we do not believe it is appropriate for the Agency to do so, should it choose to provide necessary to ensure “deicing for safe-taxiing,” ADF usage guidelines it must expressly acknowledge any such guideline included in a permit must be reasonably related to climatic conditions prevailing at the airport in question, subject to FAA safety requirements and subject to exception at the sole discretion of pilot in command.

D. Treatment Standard

1. Modify Proposed ADF Treatment Standard⁷⁵ to Reflect Actual Performance of Model Technology (AFBRs)

The Proposed Rule establishes BAT and NSPS effluent limitations for aircraft deicing runoff based on data from the AFBR system at ALB. Specifically, using data from the two AFBR units at ALB, EPA determined that the 271 mg/L COD daily maximum represents the median of the 99th percentile of the daily values from each unit and 154 mg/L COD maximum weekly average represents the median performance of the 97th percentile of the weekly average performance of each unit.

However, the ADF Treatment Standard does not represent the performance of ALB’s system. Nor does it represent the performance of the only other currently operating AFBR system, i.e., at CAK. In addition, the ADF Treatment Standard does not fairly reflect the performance that can be expected from AFBRs deployed at the other airports EPA anticipates will need to install AFBR treatment systems – particularly at much larger and much smaller airports.

provide sufficient basis for promulgating (or even proposing a regulation). While single, isolated data points may suffice when regulating water quality, regulation of air safety requires far more rigor.

⁷⁴ See Section IV(B) herein for a more detailed discussion of the proposed 25-gallon limitation.

⁷⁵ TDD at 14-15, 14-16. Because the BAT and NSPS standards are the same, for simplicity we use “ADF Treatment Standard” to refer to both.

The following technical analysis describes four respects in which the data in the Record appear to call into question the effluent limitations EPA has extrapolated. The Agency must re-compute its proposed ADF Treatment Standard to reflect these variables so that any final ELG contains effluent limitations that reasonably reflect the model technology's capacity to perform across the range of airports to which the Rule will apply.

a. **Total COD vs. Soluble COD**

EPA used 10 years of process monitoring data collected by ALB to evaluate and establish AFB Treatment Standards of 271 mg/L (maximum daily discharge) and 154 mg/L (weekly average discharge). The data provided by ALB consists of daily grab samples of effluent⁷⁶ from both AFB reactors and analysis for soluble COD.⁷⁷ EPA was aware of this as indicated through a confirmation telephone call with ALB and other communications.⁷⁸ EPA's proposal to establish limitations for COD is technically flawed in that EPA misrepresents the data by establishing a limit for COD instead of soluble COD, the analytical parameter measured by ALB.

The analytical methods for COD established in 40 CFR Part 136 do not differentiate between total and soluble COD. The data collected at ALB were not collected for compliance purposes but rather for process monitoring purposes. However, EPA failed to acknowledge the form of COD data collected at ALB.

EPA further confuses the issue through a comparison of data EPA collected for total COD during their sampling site visit with the data collected by ALB through their monitoring program.⁷⁹ Specifically, the EPA samples consisted of 24-hour composites collected at the confluence of the two reactor effluents. These samples were analyzed for total COD. Although EPA did not utilize their sampling results in the calculation of the COD limits, EPA provides a comparison of the two sets of data. The data collected by EPA for total COD averaged 139 mg/L over the 5-day sampling period. In comparison, the ALB data for soluble COD averaged 68 mg/L over the same 5-day period, approximately 50% lower than the EPA results. While these data are not directly comparable due to differences in sampling periods (*i.e.*, 24-hour composite versus grab samples), the data indicate that there are significant differences between total and soluble COD concentrations.

Given that the data utilized by EPA to develop the limitations was for soluble COD, EPA must clarify the limitations and define the analyte as soluble COD. As noted above, the analytical method for COD does not provide guidance for the filtration of the sample prior to COD analysis. For other EPA methods in which the dissolved or soluble phase of the analyte is to be measured, EPA has defined 'dissolved analyte' as the 'concentration of analyte in aqueous

⁷⁶ Document - 1134.

⁷⁷ Documents - 1114 (data from each reactor clearly labeled "S COD").

⁷⁸ Document - 0716 (in "the long term data . . . for the anaerobic system . . . Feed COD is total influent COD and ***the effluents are S COD, which is soluble COD***) (emphasis added); Document-1131 (ALB data is "from 1999 - 2007 (many years worth of data) and is very straight forward with date, COD in (mg/L), ***soluble COD out (mg/L)***") (emphasis added).

⁷⁹ TDD at 14-8, Table 14-1.

phase that will pass through a 0.45 µm filter.⁸⁰ EPA should adopt this definition and define S COD (soluble COD) in the rule as that COD in aqueous phase that will pass through a 0.45 µm filter.

b. Failure to Address Adequately Sources of Variability

In developing the effluent limitations, EPA utilized 10 years of monitoring data from reactors R101 and R102 at ALB and analyzed each reactor independently. For the daily limit, EPA calculated the 99th percentile daily value for each reactor and established the median of the two results as the daily maximum discharge limitation. For the weekly limit, EPA used exactly the same procedure, but used the 97th percentile value. This approach fails to recognize and address adequately variability associated with the season and the individual reactor.

As noted above, EPA used ten years of monitoring data to make these calculations. EPA acknowledges that this data “had substantial variability between years.”⁸¹ In addition, statistical analysis of the data indicated that “effluent data appear to have periods with relatively little daily variation *and periods with significant daily variation*,” and “suggest[s] that there is a statistical relationship between the influent and effluent measurements.”⁸² Unfortunately, the analysis failed to consider the effect of influent COD loading on effluent concentration. Specifically, AFB systems are operated to maintain constant loads. Thus, while influent concentrations may vary, the operators attempt to hold influent loads relatively constant through the adjustment of flow. Thus, it is not surprising that a statistically significant relationship between influent and effluent concentration was not identified. However, none of this was taken into account in the derivation of the proposed ADF Treatment Standard. The ALB data, specifically data from seasons in which loading was the highest, requires that it must be taken into account. For example, the influent COD loads for the 2002 season were significantly higher than were loads for the other seasons. The average daily influent load for the 2002-2003 season was 47% higher than the average daily load for all seasons and the average load for the 2002-2003 season was 2.65 times higher than the lowest loading season (2006-2007). Calculation of the 99th percentile daily maximum concentration based on the 2002 season results in a limit of 362 mg/L as SCOD. This is a 33% increase above the proposed limitation.

Given this difference at ALB, the ADF Treatment Standard should be re-evaluated to account for the impact of severe winters and operational periods when the system was operated

⁸⁰ Method 200.7

⁸¹ Document - 1165 at 1.

⁸² Document - 1155 (emphasis added). We note that this relationship was found to be insignificant after the removal of 140 outliers and data between reactors was combined. We also note that EPA’s consultant failed to derive a reliable model to predict the relationship between weather, departures and influent COD concentrations indicating that the failure resulted from the lack of a “moderately strong” statistical relationship. Document - 1155 at 11. The consultant’s failure to derive a reliable model based on COD influent concentration as well as their failure to consider the effect of influent load does not demonstrate no such relationship exists, especially in the face of data (*e.g.*, 2002-2003) that indicates there is a strong relationship. Certainly, the failure to derive a model *for one airport* does not demonstrate that the relationship does not exist and cannot excuse the failure to take it into account.

at, or near, system design capacity. Certainly, deicing operations along the East Coast for the 2009-2010 deicing season will be substantially increased compared to previous deicing seasons, and these increased loads and increased influent concentrations might be expected to impact AFB performance.

The variability in deicing and potential influent concentrations is also likely to occur within the same season at the same airport (*e.g.*, light freezing rain conditions versus light snow), between seasons (severe winters versus light winters) and between airports. The effect of winter severity on AFB operations should be considered and the use of longer-term limitations (*e.g.*, weekly or monthly limitations as opposed to a daily maximum limit) should be evaluated. In the design of airport stormwater treatment systems, detailed information is gathered regarding weather intensity, storm event frequency and severity, and volume of impacted stormwater produced at an airport to allow integration of all system components (storage, equalization and treatment) and calculation of optimal system sizing. EPA's limited analysis of data from a single airport AFB system fails to recognize the effect of weather on system performance. Recognition of the effect of weather and type of collection technology employed on system design is critical in the establishment of limitations.

As noted above, ALB utilizes two AFB reactors for the treatment of stormwater impacted by deicing operations. Influent for each reactor is drawn from the same pond and the units are typically operated in parallel. However, derivation of the 99th percentile for the two reactors results in drastically different values (326 versus 216 mg/L). EPA dealt with this difference by taking the median value. However, the reasons for the differences are not known.

Although both reactors draw from the same influent pond and thus have similar, if not identical, influent concentrations, effluent concentrations for the two reactors are significantly different with reactor R101 achieving a slightly lower average discharge concentration. Further, when only 2002 data are evaluated, reactor R101 is significantly higher in concentration than reactor R102. EPA attributes these differences to "slightly different influents, equipment and other factors."⁸³ By utilizing data from both reactors, EPA acknowledges that both reactors are being operated diligently. Thus, use of the mean 99th or 97th percentile value for the two reactors fails to acknowledge that diligent operation of an AFBR can result in 50 percent higher percentile value. The use of the median of the two 99th or 97th percentile values for the reactors at ALB to establish ADF Treatment Standards obscures the fact that the performance of the two reactors differ by 110 mg S COD/L (the difference between the 99th percentiles calculated for the ALB reactors). Since it is implied that both reactors are operated diligently, then it is the data from the less-well performing unit on which EPA should base its BAT limit.

c. **CAK Performance vs. ALB Performance**

Since the development of the draft ELG proposal, the only other example of an AFB reactor designed to treat stormwater containing residual ADF has been placed into operation at CAK. This system is considered state of the art and although similar to ALB in terms of the load of COD treated per cubic foot of media, it is different from the ALB system in both the concentration of material treated (CAK average influent S COD concentration is 68,951 mg/L

⁸³ TDD at 14-6.

compared to the average ALB influent concentration of 5,620 mg/L COD) and the rate of treatment (average flow at ALB was 90 gpm compared to average flow at CAK of 4 gpm for both reactors combined). It is prudent to utilize the performance of this new unit to determine whether treatment efficiencies based on ALB data alone are supportable.

We have obtained data from the first year of operation of this system and utilized them to calculate the 99th percentile discharge SCOD concentration. These data result in the calculation of a 99th percentile concentrations of 402 and 255 mg/L SCOD with a median concentration of 328.5 mg SCOD/L.

Note that as part of this calculation, a significant amount of data collected during system start-up was eliminated because the system operation during those periods was characterized as “system upset”. Thus, the 99th percentile concentrations calculated above do not reflect start up conditions. Specifically, effluent start-up data from 11/1/08 to 12/14/08 were eliminated due to “system upset” conditions. During this period, the average effluent concentration was 1,215 mg/L S COD and ranged between 212 and 2,238 mg/L S COD. Had these data been included to represent start-up conditions, the percentile concentration (which forms the basis for establishing the daily maximum standard) would be a significantly higher value.

These data illustrate two concepts. First, the higher influent concentrations at CAK resulted in a higher effluent concentration. Second, there is significant variability between the two CAK reactors (although both received similar if not identical influents). The imposition of more restrictive limits on CAK (based on ALB performance) may require CAK to operate at a lower loading thereby increasing storage requirements (*e.g.*, to comply with the limit, the water must be treated at a lower rate). Put another way, using data from just one of two extant plants already puts the second plant, which EPA would likely agree is a state of the art AFBR, out of compliance. Further, because the root cause of the variability between reactors is not known (and apparently not controllable), the effluent limitation should be based on the higher of the two limitations.

d. Performance Degradation During Start-Up

EPA has recognized that the AFB reactors will be operated as semi-continuous batch treatment systems. The units will be placed into operation when a sufficient volume of stormwater has been collected to sustain operation of the reactor for a sufficient period of time. During system start-up, effluent concentrations, as evidenced by the CAK start-up data, are likely to be higher and more variable as the bacteria acclimate to the influent compared to periods of continuous operation. Further, frequent changes in influent COD loading will result in increased effluent COD variability as the bacteria respond to changing conditions. Thus, continuous operations with limited variability will produce more stable effluent. Unfortunately, because influent concentrations and load are governed to a large extent by weather, the system operator has limited ability to respond to these changing conditions and can only adjust influent flow rate to minimize impacts on effluent quality. These limited system adjustments are further constrained by system design parameters (*i.e.*, hydraulic limitations).

To minimize frequent start/stop operations, an airport may elect to collect stormwater until sufficient quantities are available to provide for long run times. However, as observed at CAK, the degradation of ADF within the storage system can significantly increase the duration

of start-up periods as well as effluent concentration and variability.⁸⁴ The model airport, ALB, as well as CAK, have sufficient deicing events (21.9 to 41 SOFP days) such that the AFB system start-up can be limited to a single period. However, a number of airports which have less frequent deicing events are also assumed to install AFB reactors to treat collected stormwater. Thus, the airport operator is faced with either storing water for long periods until sufficient volume has been collected to provide for long run times (thereby risking issues associated with fluid degradation) or allow for frequent start/stop operations with associated increased variability.⁸⁵ Either mode of operation will result in higher effluent variability and increased potential for exceedance of the limitation.

For the reasons stated above, ATA believes that the Agency must re-compute its proposed BAT effluent limitations for aircraft deicing discharges to reflect these variables so that any final ELG contains effluent limitations that reasonably reflect the model technology's capacity to perform across the range of airports to which the Rule will apply.

E. New Source Performance Standards

The proposed New Source Performance Standards ("NSPS") would require 60% collection of available ADF from all new sources.⁸⁶ For the purposes of NSPS applicability, the Proposed Rule defines "new source" to include "any new runway constructed at a Primary Airport, the deicing operations associated with the departures on the new runway and the deicing of paved surfaces associated with the new runway."⁸⁷ In effect, the Proposed Rule would require new runways at existing Tier Two airports to achieve the Tier One collection efficiency of 60% of Available ADF. As addressed in greater detail in Section VIII of these comments, the proposal to define new runways as new sources and subject to NSPS is not appropriate under, and inconsistent with, the CWA and EPA regulations and policy. While the preamble to the Proposed Rule states that a new runway would be deemed to be a new source only if it meets all of the criteria in existing EPA regulations, the language of the Proposed Rule contradicts the preamble by prescriptively defining all new runways as new sources without consideration of existing regulatory criteria. EPA should remove new runways from the definition of new source in the proposed rule and instead refer to existing regulatory criteria for new source determinations.

⁸⁴ Arendt, T. and J. Prior. July 8 2009. ACI-NA/ATA/RAA Deicing Management Conference. Akron-Canton Airport Deicer Management System North Canton, Ohio

⁸⁵ Arendt, T. and J. Prior. 2009.

⁸⁶ Proposed § 449.11(a) ("New Source Performance Standards").

⁸⁷ Proposed § 449.2 ("New source").

PART 2 – SPECIFIC COMMENTS

IV. EPA FAILS TO CONSIDER SAFETY IMPACTS

Consistent with the Congressional command that safety must be the “highest aviation priority,”⁸⁸ safety is the core mission of this industry. Consequently, safety is the “gatekeeper” issue whenever a project, initiative or regulation has the potential to affect ground and/or air operations – if safety would be compromised the project or initiative fails by definition. Safety is even more central in the context of this rulemaking because, as EPA recognizes, safety is the sole purpose and aim of aircraft and airfield deicing and anti-icing activities.⁸⁹ Even so, in this rulemaking, the Agency fails to consider safety issues adequately.⁹⁰

A. EPA Fails to Consider Safety in Its Designation of BAT

1. ADF Collection for Tier One Airports

EPA fails to consider safety impacts when designating ADF Collection BAT for Tier One airports. In Section VII(A)(2) below we explain that EPA’s finding that land is “available” to accommodate CDPs at Tier One airports is the keystone in its decision to designate CDPs as BAT for Tier One airports. EPA identified Document - 1171 as the basis for its “determin[ation] that these constrained airports have sufficient land to install the necessary collection technologies.”⁹¹ This analysis (hereinafter the “Land Availability Analysis” or Document -1171) is fatally flawed in many respects. Here, we focus on the failure to account for safety imperatives.

EPA fails to consider safety in its Land Availability Analysis even though it cites FAA Advisory Circular 150/5300-14B,⁹² which details CDP design issues critical to maintaining the safety of air and ground operations. The AC begins:

⁸⁸ 49 USC §47101(a)(1). *See also* 49 USC §40101(a) (“[T]he Secretary of Transportation shall” . . . “(1) assign[] and maintain[] safety as the highest priority in aviation”).

⁸⁹ Notice at 44682: “The Federal Aviation Administration requires airlines to deice aircraft and airfield pavement to protect the safety of passenger and cargo operations . . . A major concern for the safety of passengers is the clearing of ice and snow buildup on runways, taxiways, roadways, gate areas, and aircraft. . . . [D]eicing is necessary to ensure the safe operation of aircraft.”

⁹⁰ In the 220+ pages of its TDD, EPA mentions safety just six times; it plays a role in its decision-making in just one instance. *See, TDD* at 4-19 (reference to refer to Material Safety Data Sheets), 5-7 (“An airline’s deicing methods must be approved by the FAA for air safety”), 8-1 (pollution prevention practices “designed to eliminate or minimize the environmental impact . . . without compromising safety”), 8-16 (“To be economically viable, alternative products must also be of comparable price and be at least as effective in maintaining air safety as the glycol-based fluids they replace”); EPA makes two references to safety as it relates to aerated ponds (at 8-6 and 13-2), which are discussed below.

⁹¹ Notice at 44692, col. 1.

⁹² AC 150/5300-14B *Design of Aircraft Deicing Facilities*. In Document - 1171, EPA cites a previous version of the AC (150/5300-14A), which was reissued as AC 150/5300-14B on

Safe and efficient aircraft operations are of primary importance in the development of any deicing facility. This AC discusses sizing, siting, environmental runoff mitigation, and operational needs of a deicing facility and how to maximize deicing capacity while maintaining maximum safety and efficiency.⁹³

The AC goes on to detail the many operational and safety considerations that affect the design of deicing pads. For example, ¶2-2 states:

To ensure aircraft safety, the location and operation of deicing facilities **must** follow the clearance and separation standards specified in AC 150/5300-13, *Airport Design*. These standards involve airspace, aircraft separations, FAA Technical Operations facilities critical areas, and Airport Traffic Control Tower (ATCT) line-of-sight criteria.⁹⁴

The AC also explains these safety requirements in detail, emphasizing in each instance that they must be followed.

EPA, however, does not attempt to consider these safety imperatives and openly acknowledges that it did not gather sufficient information to evaluate these and other safety imperatives:

Since ERG does ***not have sufficient information to evaluate airport ground traffic patterns*** at the selected locations for deicing pads, the locations shown are for conceptual purposes only. In addition, ERG does not have sufficient information to consider issues such as existing underground utilities or soil types which ***may also preclude locating pads*** at the conceptual locations shown on the Google Earth diagrams.⁹⁵

EPA thus admits that it can have no idea whether pads at the “conceptual” locations could, in fact, be reconciled with the safety of ground operations or even whether the locations could support a safely-engineered pad.

Similarly, EPA does not consider the many safety-based design criteria for the pads themselves, detailed in Chapter 3 of the AC, including:

February 5, 2008, two days before the date on Document - 1171. EPA clearly was aware of the update, which is included in the Record as Document - 0741, and as Attachment A to Document - 0740. EPA also specifically listed AC 150/5300-14B as one of several FAA has issued dealing with deicing issues in the Notice at 44682, col. 1.

⁹³ Document - 0741 at 1.

⁹⁴ Document - 0741 at 3 (emphasis added).

⁹⁵ Document - 1171 at 3 (emphasis added). We note the description of the analysis EPA provides in the Notice (at 44692, col. 1) is not accurate: it states the analysis was based on “site plans provided in the questionnaire” not Google Earth diagrams.

- Separation standards for off-gate deicing pads (§3-2), which ensure adequate provision for vehicle safety zones.
- Criteria for deicing pad layouts (§3-5), including the need to account for exiting jet blast (§3-5(c)) to ensure continued effectiveness of applied deicing fluids.

EPA's Land Availability Analysis also ignores other safety imperatives implicated by the need to co-locate facilities that must accompany the deployment of deicing pads. For example, the cited *Design of Aircraft Deicing Facilities* AC, highlights that "to protect the performance characteristics of [ADF] from degradation" storage and transfer systems must meet exacting design specifications and be appropriately sized to match airport-specific needs.⁹⁶ EPA also does not consider safety issues associated with facilities necessary to meet the required storage of millions of gallons of stormwater that must be collected in conjunction with CDPs. Stormwater storage facilities also would need to be located consistent with FAA safety standards, e.g., outside runway protection zones.⁹⁷

2. ADF Collection for Tier Two Airports

EPA also fails to consider safety impacts when designating ADF Collection BAT for Tier Two airports. The technology basis for that standard is operation of GRVs. The operation of any vehicle on the airside area of an airport presents unique safety challenges and, as the FAA emphasizes, "control of [such] vehicular activity is of the highest importance."⁹⁸ Indeed, the FAA advises that "[a]irport operators should keep vehicular and pedestrian activity on the airside of the airport to a minimum . . . Where vehicular traffic on airport operations areas cannot be avoided, it should be carefully controlled."⁹⁹ Caution is only increased in conditions that prevail during winter operations: "Additional consideration should be given to vehicle operations during low visibility. Poor weather conditions (snow, fog, rain, etc.) may obscure visual cues, roadway markings and airport signs."¹⁰⁰ The importance of safety in operating GRVs is emphasized in a training manual prepared by Inland Technologies, a copy of which (though only partial) is included in the Record:

The information to follow is intended to familiarize the operator with the Glycol Recovery Vehicle (GRV). The operator's responsibility is the recovery of aircraft deicing fluid in the **safest**, and most efficient manner possible, but at no time should an

⁹⁶ Document - 0741 at 6 (§2-6).

⁹⁷ Safety issues also are implicated by the need to construct the CDPs and associated facilities. FAA provides guidance on addressing these issues in AC 150/5370-2E, *Operational Safety on Airports During Construction* at i (January 17, 2003) ("Aviation safety is the primary consideration at airports, especially during construction").

⁹⁸ AC 150/5210-20, *Ground Vehicle Operations on Airports* at 3 (June 21, 2002).

⁹⁹ AC 150/5210-20 at 2.

¹⁰⁰ AC 150/5210-20 at 4.

operator **sacrifice safety** for increased fluid collection. In addition to the written information contained in this manual each operator must receive practical hands-on training before he or she may safely operate during actual recovery situations.

...

The operator must remain aware of all aircraft and vehicle movements while working on the airfield. If so equipped, the air-to-ground radio should be tuned to the proper frequency, thereby keeping the operator informed of aircraft movements.¹⁰¹

This is a key consideration when deploying GRVs because: “[t]he overall effectiveness of glycol collection vehicles varies based on the number of vehicles used relative to the areas and deicing activities served.”¹⁰² In addition, the efficiency of glycol recovery using GRVs is directly affected by safety requirements that determine time available between aircraft operations:

In the operation of the actual recovery of spent deicing fluids, the GRV speed is very important. The slower the driving speed of the GRV, the more efficient the recovery of the fluids, as the vacuum is over then contaminated area longer. The operator must realize that there are restrictions of time that effect [sic] the recovery of areas, as aircraft may be reusing the same gate or area upon the next arrival.¹⁰³

In setting forth the “technical specifications” compliance with which is deemed to satisfy the ADF Collection BAT for Tier Two Airports – *i.e.*, collection of 20% of available ADF – EPA does provide that “ADF collection by GRV shall commence as soon . . . as is practicable and safe.”¹⁰⁴ However, safety as defined by the FAA and GRV operators alike plays absolutely no role in EPA’s determination of what constitutes “well-designed, well-operated collection” using GRVs.¹⁰⁵ Rather, the number of GRVs EPA assumes are needed to achieve BAT at any given airport is based on exclusively an infrastructure characteristic -- the number of stormwater outfalls.¹⁰⁶ The record here demonstrates that the number of GRVs needed to achieve the Tier Two collection standard at a particular airport will be determined primarily by the number, type and frequency of aircraft operations at the airport. Whether that number of GRVs can be safely deployed, consistent with FAA, airline, and operator safety mandates is a separate, critically important question. Yet, EPA entirely failed to consider either the factors that actually affect the

¹⁰¹ Document - 0742 (Inland Technologies, *Glycol Recovery Vehicle Training Manual* at 1 (emphasis original) and 17-18 (June 2006)).

¹⁰² Document - 1125, Fact Sheet 23 at 1.

¹⁰³ Document – 0742 at 17-18.

¹⁰⁴ Proposed §449.20(b)(1)(i)(C).

¹⁰⁵ Notice at 44690, col. 1.

¹⁰⁶ TDD at 11-14 to -15.

number of GRVs necessary to achieve its proposed Tier Two standard or the ability to safely deploy those numbers of units at specific airports when setting the proposed ADF Collection BAT at Tier Two Airports.

3. ADF Treatment BAT

Similarly troubling, is EPA's failure to consider such a critical issue in the course of selecting the technology basis for treatment of ADF. The treatment reactors at CAK are 10 feet in diameter and 32 feet in height; at ALB they are 14 feet in diameter and 32 feet in height.¹⁰⁷ Obviously, the height of these facilities alone requires that they be located to ensure they do not pose a safety hazard or disrupt air traffic flow patterns.¹⁰⁸

But perhaps most notable in the context of this rulemaking EPA fails to acknowledge and account for the potential for treatment facilities that would be required under the Proposed Rule to pose a safety hazard as wildlife (in particular, bird) attractants. EPA has signed a Memorandum of Agreement ("MOA") in which it agreed:

that a variety of other land uses (e.g., ***storm water management facilities, wastewater treatment systems***, landfills, golf courses, parks, agricultural or aquacultural facilities, and landscapes) attract hazardous wildlife and ***are, therefore, normally incompatible with airports***. Accordingly, new, federally-funded airport construction or airport expansion projects near habitats or other land uses that may attract hazardous wildlife must conform to the siting criteria established in the FAA Advisory Circular (AC) 150/5200- 33, Section 1-3.¹⁰⁹

In the referenced section 1-3 of AC 150/5200-33,¹¹⁰ FAA recommends that any wildlife attractant (including, as noted in the above MOA, stormwater management facilities like ponds and stormwater treatment facilities) be placed at least 10,000 feet away from the air operations area ("AOA") for any airport serving jet aircraft and five statute miles away "if the attractant could cause hazardous wildlife movement into or across the approach or departure airspace."¹¹¹ The FAA is even more definitive with respect to "new wastewater treatment facilities," in that it "strongly recommends against the construction" of such facilities within 10,000 feet of the AOA

¹⁰⁷ Document - 0834 at Slide 24.

¹⁰⁸ See AC 150/5300-13, *Airport Design*, and 14 CFR Part 77 - *Objects Affecting Navigable Airspace*.

¹⁰⁹ *Memorandum of Agreement Between the Federal Aviation Administration, the U.S. Air Force, the U.S. Army, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, and the U.S. Department of Agriculture to Address Aircraft-Wildlife Strikes*, Section I.J. (signed by EPA Assistant Administrator for Water on January 17, 2003) (emphasis added).

¹¹⁰ *Hazardous Wildlife Attractants on or Near Airports*, reissued as AC 150/5200-33B (August 8, 2007).

¹¹¹ AC 150/5200-33B at ¶¶ 1-3 and 1-4.

and instructs that “airport operators should voice their opposition to such facilities if they are in proximity to the airport.”¹¹²

Given that the Proposed Rule also designates anaerobic fluidized bed reactors (“AFBRs”) as BAT for treatment of ADF and these facilities certainly fall within AC 150/5200-33B’s definition of “wastewater treatment facility,”¹¹³ the need to account for the possibility of bird strikes resulting from location of AFBRs at airports cannot be avoided. Yet, despite having signed the MOA and relying on documents that reference AC 150/5200-33 (and, as discussed below, actually mentioning the issue with respect to aerated ponds), EPA does not address the potential bird strike hazard issue or even list AC 150/5200-33 as among those it considered in the rulemaking.¹¹⁴

The successful location of AFBRs at two airports, ALB and CAK (and of stormwater detention/retention ponds at several airports around the country), indicate that such concerns can be addressed. At the same time, the recent “Miracle on the Hudson” incident highlights the fact that it is imperative that safety issues are addressed at *all* airports. This would remain true even if EPA did not propose AFBRs as BAT for the New York airports. Yet, the Agency makes no attempt to explain why AFBRs – which clearly qualify as “wastewater treatment systems” the Agency has acknowledged are “normally incompatible with airports” – nonetheless deserve designation as the best available treatment technology.

4. **The Single Instance in Which EPA Mentions Safety in the Context of Designating BAT Demonstrates Its Failure to Consider the Issue Appropriately**

¹¹² AC 150/5200-33B at ¶ 2-3(d).

¹¹³ Relevant definitions are provided in AC 150/5200-33B, Appendix 1 as follows:

Air operations area. Any area of an airport used or intended to be used for landing, takeoff, or surface maneuvering of aircraft. An air operations area includes such paved areas or unpaved areas that are used or intended to be used for the unobstructed movement of aircraft in addition to its associated runway, taxiways, or apron.

...

Wastewater treatment facility. Any devices and/or systems used to store, treat, recycle, or reclaim municipal sewage or liquid industrial wastes, including Publicly Owned Treatment Works (POTW), as defined by Section 212 of the Federal Water Pollution Control Act (P.L. 92-500) as amended by the Clean Water Act of 1977 (P.L. 95-576) and the Water Quality Act of 1987 (P.L. 100-4). This definition includes any pretreatment involving the reduction of the amount of pollutants, the elimination of pollutants, or the alteration of the nature of pollutant properties in wastewater prior to or in lieu of discharging or otherwise introducing such pollutants into a POTW. (See 40 CFR Section 403.3 (q), (r), & (s)).

¹¹⁴ Notice at 44682, col. 1

The failure to consider safety in setting these contexts stands in marked contrast to the only instance we have been able to identify in which safety played a role in a decision regarding BAT. EPA explains its decision “the aerated pond [] was not selected as the technology basis for BAT for mainly logistical reasons” but also because:

FAA discourages the installation of new stormwater detention ponds at airports as they can be a lure for migratory birds. In those situations birds and aircraft are safety hazards *to each other*.¹¹⁵

The Agency explains the “logistical reasons” for rejecting ponds as BAT included that they “require large areas for installation.”¹¹⁶ Yet, in evaluating whether land was available for aerated ponds EPA did not even consider the potential safety hazard they pose:

One concern raised by EPA is the space requirements for retention ponds. Unlike other technologies, ponds require a large footprint and some airports might not have sufficient space for expand and construct a pond (*e.g.*, airports within major cities). To determine if space was available for a retention pond system at an airport, EPA examined the total current land use at representative airports located in urban areas. Based on the analysis, EPA decided that if an airport currently utilizes more than [sic] 35 percent of its current area for active airport operations, then it was not a candidate for a retention pond system. These airports would need to use above-ground or below-ground tanks to store ADF-contaminated stormwater prior to treatment or off-site discharge to a POTW.¹¹⁷

As detailed above, EPA has signed an MOA with FAA that certain land uses, specifically including “storm water management facilities” and “wastewater treatment systems” are “normally incompatible with airports.” Yet, the Record reflects no attempt to explain how the “35 percent” land availability threshold adopted above accounts for the potential bird strike hazard or is consistent with EPA’s commitments in that MOA.¹¹⁸

¹¹⁵ Notice at 44692 (emphasis added). In the TDD, EPA’s language reflects that the FAA’s focus is on air safety (“FAA discourages the installation of new stormwater retention ponds at airports, as they can be a lure for migratory birds, which are a safety hazard for aircraft,” TDD at 8-6) but EPA reiterates its perspective that the threat to people and birds are coequal (TDD at 13-2).

¹¹⁶ Notice at 44692. Col. 3.

¹¹⁷ TDD at 11-24.

¹¹⁸ We note EPA only examined urban airports. Clearly, birds do not observe human-made boundaries and land use determinations and are as likely to pose a hazard in rural and other non-urban environments. We note also that the description of this analysis is not sufficient to provide proper notice of the Agency’s reasoning. Simply reporting that the Agency “examined” land use and “based on the analysis, decided” does not provide any basis for understanding how EPA arrived at its decision – while the decision is reported, no criteria are identified for making the determination or even what constitutes “active airport operations.” AC 150/5200-33B, Appendix 1, defines “air operations area” as “any area of an airport used or intended to be used for landing, takeoff, or surface maneuvering of aircraft. An air operations area includes such paved areas or unpaved areas that are used or intended to be used for the unobstructed

While the Agency is correct to acknowledge the potential danger posed by bird strikes with respect to aerated ponds, it should (indeed must) consider the danger with respect to AFBRs. Most importantly, though, the Agency must pay equal attention when other types of safety issues pose no threat to wildlife but instead apply exclusively to people.

B. EPA Fails to Consider Safety Adequately in Proposing the 25-Gallon Limit Applicable to “Deicing for Safe Taxiing”

EPA’s proposed 25-gallon limit on the amount of ADF that may be used in “deicing for safe taxiing”¹¹⁹ illustrates the need for EPA to ensure industry and the FAA have adequate time before any re-proposal to provide comprehensive comments on critical safety issues.

EPA explains that this proposed limit “is based on a current requirement at Denver International Airport.”¹²⁰ It fails, however, to note that the airport’s NPDES permit includes a safety based-exception (which we note below also has an operational component) that allows full deicing off the CDPs in some circumstances:

Under special situations, for safety reasons Airport Operations may grant permission for full deicing at the A and C concourse gates where it is not normally allowed. Full deicing at A and C concourse gates will only be allowed when authorized by the airport manager or his designee. Full deicing at any other areas is prohibited.¹²¹

The Agency also fails to account for safety issues when it proposes to apply that standard, developed for an arid environment, at other airports that experience drastically different winter conditions. The NPDES permit for PHL, for example, provides that deicing in wet weather conditions should take place at the airport’s pads, but allows deicing activities in terminal areas under certain conditions. The only activity to which a limit applies is “defrosting,” which is specifically defined as “the limited application of deicing fluids to an aircraft during dry weather to remove minor accumulations of ice crystals that may have appeared in the absence of atmospheric precipitation. Defrosting requires no more than forty (40) gallons of deicing fluid

movement of aircraft in addition to its associated runway, taxiways, or apron.” From EPA’s description it is impossible to tell if its analysis of “active airport operations” tracks this definition. Finally, EPA should also “show its work” in making its calculations.

¹¹⁹ Proposed §449.20(b)(1)(i)(A) and (ii)(B).

¹²⁰ Notice at 44714. To our knowledge, there is no other information about the limit in the record (including no documentation of the limit itself) except for an ambiguous reference in EPA’s Site Visit Report for DIA: “All deicing is done on deicing pads, with the exception of low level gate deicing (up to 25 undiluted gallons of ADF) to allow for safe plane movement.” Document - 0513 at 4. There is no information in the record that indicates that the limit is in fact intended to ensure “safe plane movement;” it apparently is an airport rule, which certainly must be consistent with otherwise applicable FAA regulations.

¹²¹ CDS Permit No.: COS-000008, Part I, Section D.2.A. Summary of Rationale at 16 (§ VI.C.1) (effective May 14, 2004).

per aircraft.”¹²² In wet weather conditions, the permit requires (as it should) any deicing necessary to meet safety requirements.¹²³

2. Deicing of specific aircraft surfaces: When the pre-flight inspection reveals the presence of ice or snow on *critical components of the aircraft* such as the windshield or engine intake ducts, *such that FAA regulations require deicing of those surfaces before the aircraft can be taxied to the deicing pad, deicing fluid will be applied* to those surfaces only before taxiing to the deicing pad.

3. Deicing of aircraft for weight reduction: When the pre-flight inspection reveals a heavy accumulation of ice or snow on the aircraft, *such that the aircraft exceeds the maximum structural weight permitted by FAA regulations*. Enough deicing fluid *will be applied in order to bring the aircraft under the maximum taxi weight permitted by the FAA*. The aircraft will then be taxied to the deicing pad for removal of the remaining ice or snow.¹²⁴

Thus, both the differences between pre-taxi deicing needs at airports around the country and the need to ensure compliance with FAA safety imperatives before taxiing in winter conditions is apparent even within EPA’s existing record and a reasonably thorough review of this record should have alerted EPA to the need to consult with FAA.

PIT is another example of an airport at which the governing environmental regulator has explicitly recognized that any restrictions on location and/or amounts of deicing fluid application must be subordinate to otherwise applicable FAA regulations. A Consent Order issued in 1994¹²⁵ required the County (as airport proprietor) and “Occupiers” (airlines) to “permanently abate the unauthorized discharges of spent de-icing fluids resulting from de-icing at Pittsburgh International Airport to waters of the Commonwealth.”¹²⁶ The Pennsylvania Department of Environmental Resources (DER) further agreed that “[n]otwithstanding this permanent abatement” certain “pre-taxiing activities” could continue, as follows:

- Defrosting. When pre-taxi inspection of an airplane during above-freezing ambient temperatures reveals the build-up of clear ice on critical components of the airplane . . . such that FAA regulations require defrosting or de-icing of those components before the airplane may be taxied to the de-icing pad . . . then de-icing fluid may be applied to the airplane in order to comply with FAA regulations before leaving the gate or ramp.

¹²² Document - 0358.

¹²³ We are aware that PHL has written to the Assistant Administrator for Water to “clarify” the interpretation of this provision. PHL states that the provision merely “allows” deicing in compliance with FAA safety mandates. This is a distinction without a difference – whether the permit requires or allows the practice, the point is the permit appropriately gives way to overriding safety imperatives.

¹²⁴ Document - 0358 (emphasis added).

¹²⁵ As we understand it, PIT’s current NPDES permit covers three oil/water separators, a landfill leachate treatment plant, the aircraft rescue & fire fighting training facility and a temporary fuel farm; it does not address deicing fluid discharges.

¹²⁶ See Consent Order.

- De-icing: When pre-taxi inspection of an airplane reveals the presence of ice, snow, or frost on critical components of the airplane . . . such that FAA regulations require de-icing of those components before the airplane may be taxied to the de-icing pad . . . de-icing fluid may be applied to the airplane in order to comply with FAA regulations before leaving the gate or ramp.

When pre-taxi inspection of an airplane reveals heavy snow or ice on the airplane such that the minimum structural taxi weight permitted by FAA regulations, and not other method of heavy snow removal is available, de-icing fluid may be applied to the airplane in order to bring the airplane under the maximum structural taxi weight permitted by FAA regulations.¹²⁷

Notably, the Order does not contain any numeric restriction on the amount of fluid that may be applied – rather, as it must, it allows the application of the amount of fluid necessary to comply with FAA safety requirements.

The proposed 25-gallon limit is not internally consistent with EPA’s own Notice. The definition of “deicing for safe taxiing” acknowledges the need to “prevent damage to a taxiing aircraft,” implicating the safety imperatives and also the potentially significant economic consequences that must be taken into account before imposing such a limit.¹²⁸ The 25-gallon limit also is inconsistent with the acknowledgement that ultimately it is the pilot-in-command that must determine whether an aircraft has been deiced adequately to allow its safe operation:

While the FAA has issued regulations and guidance on conducting deicing/ anti-icing operations, the aircraft pilot is ultimately responsible for determining whether the deicing performed is adequate. The pilot may inspect the aircraft after deicing and order additional deicing or anti-icing.¹²⁹

Here the Agency acknowledges that establishing any limit is inconsistent with the imperative that the pilot in command must have the last word on deicing required to ensure safe operation of the aircraft.

As explained in Sections I (A) and III (C)(4) above, it is not within EPA’s power to establish any “Deicing for Safe Taxiing” limit because the FAA has exclusive jurisdiction over safety standards applicable to operation of aircraft.

¹²⁷ *Id.* Similar provisions allow anti-icing activity as well.

¹²⁸ Proposed § 449.2 (definition of “*Deicing for safe taxiing*”).

¹²⁹ Notice at 44683, col. 1.

V. EPA FAILS TO PROVIDE ANY REASONABLE CONSIDERATION OF IMPACTS TO AIRCRAFT OPERATIONS BOTH AT INDIVIDUAL AIRPORTS AND THROUGHOUT THE NAS

A. Consideration of Operational Impacts Is Critical to this Rulemaking

Even with the recent dramatic downturn in the economy, the NAS is under tremendous strain. In some geographic areas the air transportation system is overwhelmed, resulting in congestion and delays throughout the NAS. After ensuring the continued safety and security of operations, today the overriding focus of the air transportation industry is to address and correct congestion and delay problems. This focus is reflected in the FAA's 2009-2013 *Flight Plan*:

Dealing with congestion and delays also remains a top priority, both in the air and on the ground. The task of reshaping airspace in the major metropolitan areas is a lengthy and, at times, a frustrating process. . . . We must also continue to enhance capacity on the ground at the nation's busiest airports. Since FY 2000, thirteen new runways have opened, providing airports with the potential to accommodate 1.6 million more annual operations. The capacity of our [NAS], however, continues to be stretched beyond its means. We are working with airport owners and operators to plan for projects that will increase airport capacity.¹³⁰

FAA identifies increasing capacity and reducing congestion as key Agency objectives and "[i]mprov[ing] bad weather departure and landing capacity with new technologies and procedures," as principal strategic component of meeting that objective; to implement that strategy FAA identifies the need to "develop flexible arrival/departure corridors."¹³¹

With respect to its potential to impact aircraft operations and the NAS, the Proposed Rule is most problematic in that it identifies use of CDPs as the technology basis for BAT for ADF Collection for 14 hub airports – of these EPA anticipates six will incur costs, including the three major New York area airports (LGA, EWR and JFK), Boston Logan (BOS) and Chicago O'Hare (ORD).¹³² These are among the most important hubs in the nation's air transportation system and, unfortunately, some of the most delay plagued stations in the system:

FAA continues to explore congestion management alternatives for New York's LaGuardia Airport, which at times has accounted for as much as 25 percent of flight delays nationwide, and also at John F. Kennedy International and Newark Liberty Airports. LaGuardia

¹³⁰ FAA, 2009-2013 *Flight Plan* at 5.

¹³¹ FAA, 2009-2013 *Flight Plan* at 20-21.

¹³² The Agency also identifies CLE, although the airport has already deployed deicing pads.

Airport is physically constrained and has had a history of intractable demand and delay.¹³³

Congestion and delays are a system concern. . . . Twenty-two airports accounted for 96 percent of the delayed flights in the United States in 2007, with three New York airports (Newark, LaGuardia, and John F. Kennedy) accounting for 37 percent of the flights delayed.¹³⁴

These problems, though local in origin, have national consequences:

Consider New York. ***One-third of America's air traffic flies to and through this corridor.*** As a result, we're constantly looking for ways to modify and streamline the routes in that region. ***As New York goes, so goes the system. A groundstop in New York can ripple coast-to-coast in less than an hour.***¹³⁵

In fact, assessing operational impacts is critical to any reasonable rulemaking that projects the need to significantly change operations at four Northeast hub airports, particularly the three New York area airports, and ORD. The resources devoted to reducing congestion and delay in the NAS reflect their overwhelming importance. For example, the City of Chicago Department of Aviation will spend \$2.8 Billion to plan and execute the reconfiguration of the airfield at O'Hare (the "OMP"). Indeed, this issue is intertwined with, and critical to, almost every major initiative and activity undertaken by the FAA. For example, the option selection phase of just one of many initiatives FAA has taken to address this issue, the New York/New Jersey/Philadelphia Metropolitan Area Airspace Redesign, "represents the culmination of over nine years of study and evaluation by the FAA to address congestion and delays at some of our busiest airports."¹³⁶ Moreover, the stakes were anything but inconsequential: "It is the FAA's

¹³³ FAA, *Report to Congress: National Plan of Integrated Airport Systems (NPIAS) - 2009-2013* at 26 (September 2008).

¹³⁴ FAA, *Report to Congress: National Plan of Integrated Airport Systems (NPIAS) - 2009-2013* at viii (September 2008). FAA also identifies the following implementing strategy and initiative (at 21):

Strategy

Increase aviation capacity and reduce congestion in the 7 Metro areas and corridors that most affect total system delay. For FY 2009, those areas are San Francisco, Los Angeles, Las Vegas, Chicago, Charlotte, New York, and Philadelphia.

Initiatives

As identified with industry stakeholders, continue implementing operational initiatives at the New York Metropolitan airports.

¹³⁵ FAA, *2009-2013 Flight Plan* at 5 (emphasis added).

¹³⁶ DOT/FAA, *Record of Decision - New York/New Jersey/Philadelphia Metropolitan Area Airspace Redesign [Corrected Version]* at 1 (September 28, 2007).

judgment that *the continued health of the aviation industry is dependent* upon the modernization actions contained in the preferred alternative.”¹³⁷

While operational impacts will not have the same priority of safety issues, they are critical to evaluation of any project or initiative affecting the airfield. Clearly too, operational impacts can be both positive and negative. Certainly this is true in the present context. Measures affecting deicing operations can have a positive or negative impact on operations. For example, depending on the situation at a given airport, the use of deicing pads may exacerbate or alleviate congestion and delay. Clearly our industry does not oppose the use of deicing pads – where it has made sense we have invested heavily in their use.¹³⁸ The calculus for assessing the viability of pads or any other deicing practice necessarily has many factors, including environmental factors, all of which must be weighed appropriately. The point here is that that calculus must include weighing operational impacts. In CWA terms, a failure to consider operational impacts is a failure to consider the “process employed” and the impact of proposed “process changes” on the subject industry.¹³⁹

In short, ANY initiative, project or policy that may affect operations – particularly at the airports projected to be most affected by the Proposed Rule – must be painstakingly scrutinized to understand its potential impact on operations at the individual airport and on the NAS. Yet, as it does with respect to safety, the Record fails to reflect any meaningful assessment or weighing of the operational impacts.

¹³⁷ DOT/FAA, *Record of Decision - New York/New Jersey/Philadelphia Metropolitan Area Airspace Redesign [Corrected Version]* at 2 (September 28, 2007) (emphasis added).

¹³⁸ In other contexts, the determination has been that from an operational perspective the benefits of deploying deicing pads do not come close to justifying the cost. *See, e.g., Memphis International Airport – Capacity Enhancement Plan update* at 19 (October 1997) (emphasis added):

It has been estimated that maximum runway use during peak periods of aircraft deicing can be achieved by providing nine widebody deicing spaces at the south end of the parallel runways. This would require a large pad oriented east/west that links holding aprons at the ends of Runway 36C and Runway 36L. Overspray would be collected for appropriate disposal by a drain system. The estimated project cost is \$26 million. This improvement was not simulated because the Design Team determined that the expected delay savings benefit *would not justify the effort required to develop model inputs*.

¹³⁹ 33 U.S.C. §§ 1314(b)(1)(B), (2)(B) and (4)(B).

B. EPA Fails to Consider Adequately Operational Impacts Associated With Use of CDPs

1. EPA Acknowledges that Requiring the Use of CDPs Would Have Operational Impacts

The Agency's failure to undertake any serious analysis of the operational impacts associated with the use of CDPs at Tier One airports is striking given that for more than a decade EPA has expressed a clear understanding of the relationship between the use of CDPs and aircraft operations. In its initial study of the industry published in 2000, the Agency observed:

[D]epending on an airport's runway and taxiway configuration, the use of centralized deicing pads may potentially create or reduce departure delays.¹⁴⁰

In this rulemaking, EPA also has expressed its understanding that deicing practices, and therefore any regulations affecting those practices, has the potential to impact congestion and delay.

When holdover times are exceeded prior to takeoff, secondary deicing/anti-icing is necessary. If an aircraft must return to the gate or another designated location for secondary deicing/anti-icing, its departure may be substantially delayed.¹⁴¹

Airports typically locate the pads near the gate areas or at the threshold of a runway to minimize delays in aircraft takeoff and to enhance the effectiveness of the ADF applied by limiting time between application and takeoff.¹⁴²

In the context of the deicing effluent guideline, a hub has potentially significant implications for airline operations. Operational delays at a hub can ripple throughout an airline's entire network causing further delays and missed connections. Furthermore, a "bank" of aircraft might need deicing in a short period of time (Holloway 2003). Thus, collecting ADF-contaminated stormwater at an operational hub might be more difficult, and airlines might be more sensitive to the implications of deicing operations to their schedule.¹⁴³

...

¹⁴⁰ Document - 0107 at 1-5 to 1-6.

¹⁴¹ Notice at 44683, col. 1.

¹⁴² Notice at 44686, col. 3.

¹⁴³ EA at 2-13.

EPA acknowledges that airport use of deicing pads increases the complexity of operations during winter weather.¹⁴⁴

Unfortunately, in this rulemaking the Agency's focus is not on considering the issues, but on attempting to explain away their significance. That is, the Agency does not "consider" operational issues in any substantive sense, but instead attempts to explain why the issues do not merit consideration. These explanations are so replete with misunderstandings, incorrect assumptions and illogic that, both functionally and legally, they are no explanations at all.

2. EPA's Asserted Reasons for Foregoing Any Analysis of the Operational Impacts Associated With CDPs Do Not Withstand Scrutiny

Despite its repeated acknowledgement of potential operational impacts, the Agency posits several "reasons" the impacts do not need to be analyzed. In each case, these reasons do not withstand scrutiny.

First, the Agency asserts that because complexities have been resolved at some airports "workable solutions . . . must be available" at all airports.¹⁴⁵ This is not analysis but wishful thinking. EPA itself acknowledges that "workable solutions" to such operational issues at "many of the nation's airports" simply are not available due to space and other constraints:

Adding capacity *requires physical space, which many of the nation's airports simply do not have*. Another barrier is that many airports are built near environmentally sensitive areas, such as waterways, that would make expansion costly *and, in many cases, prohibited*.¹⁴⁶

Thus, even the Agency contradicts its assertion that a "workable solution must be available."¹⁴⁷ FAA agrees there is no "workable solution is available" at some airports:

[T]here are a handful of airports where demand exceeds capacity . . . in the long term where *capacity expansion is not a practical option* (such as New York's LaGuardia Airport).¹⁴⁸

A "workable solution" to any operational dilemma may always exist in some abstract sense, but the unavoidable, and here, the unanswered question is: At what cost? EPA itself acknowledges that at "many" airports, the practical reality is that the costs are prohibitive. "Workable" CDPs at

¹⁴⁴ EA at 4-3.

¹⁴⁵ EA at 4-3.

¹⁴⁶ EA at 2-16 (emphasis added).

¹⁴⁷ Indeed, the Agency appears to suggest here that environmental restrictions would "prohibit" the acquisition of land otherwise necessary to comply with the Proposed Rule.

¹⁴⁸ FAA, *Report to Congress: National Plan of Integrated Airport Systems - 2009-2013* at 26 (September 2008).

land constrained airports may, for example, require land reclamation which entails considerable economic (and environmental) impacts. If those costs cannot justify expansion of the airfield at LGA and “many” other airports, it is apparent that they cannot justify accommodation of a CDP. If the Proposed Rule is to be based on the bald assertion that “workable solutions . . . must be available,” then it is the Agency’s obligation to quantify and then justify the cost of solutions that it and others previously have understood not to be workable. That obligation is not met on this Record.

Further, EPA ignores other complexities that must first be resolved to find a “workable solution” at any given airport. The City of Chicago Department of Aviation describes the operational complexities attendant to the OMP (reconfiguration of the airfield at ORD):

In addition to its primary capacity benefits, the OMP will conform to applicable FAA airport design standards and safety regulations, including wind coverage, runway separation distances, and runway/taxiway crossings. Through a reduction in the number of runway intersections and specifically designed aircraft taxi procedures, OMP will result in fewer active runway crossings in the middle third of the runway than the current airfield, conforming to suggested best practices.¹⁴⁹

Clearly, deployment of deicing pads at ORD will disrupt the “specifically designed aircraft taxi procedures” and could require more runway/taxiway crossings. Other complexities that must be taken into account arise out of the interrelatedness of operations at many airports. FAA, for example, describes such complexities attendant to the NY/NJ/PHL Metropolitan Area Airspace Redesign:

It is often said that the airspace in the New York/New Jersey/Philadelphia area is some of the most complex anywhere in the world. . . . Even . . . visual images, though more effective than words, fail to depict fully the complexity and interdependences that these different procedures have on each other. One way to grasp the complexity of the problem and the delicacy of the limited options available as potential solutions is to observe, on a delayed but real time basis, the radar tracks of aircraft landing and departing at Newark Liberty, La Guardia, Kennedy, and Philadelphia, over the internet. . . . Observers can see, for example, how only a few miles separates the streams of arrivals at Newark and La Guardia, how southbound La Guardia departures are “climbed over” Newark Arrivals, and how the approach path to La Guardia can depend in part on runway use at Kennedy.¹⁵⁰

¹⁴⁹ FAA, *Report to Congress: National Plan of Integrated Airport Systems - 2009-2013* at 32 (September 2008).

¹⁵⁰ DOT/FAA, *Record of Decision - New York/New Jersey/Philadelphia Metropolitan Area Airspace Redesign [Corrected Version]* at 2 (September 28, 2007).

Clearly, if a “workable solution” exists at all, it will only be identified after grappling with “the complexity of the problem.” While the deployment of CDPs may be less complex than the redesign of airspace, it unquestionably would affect the interdependences of “streams of arrivals,” departures and runways. If indeed available, a “workable solution” will be found only after choosing among the “limited options available” without disturbing the “delicacy” of balance already struck after nearly a decade of work in an effort to ensure “the continued health of the aviation industry.”¹⁵¹

EPA also posits that the cost of operational impacts associated with CDPs need not be analyzed because it “believes that as long as deicing pads do not reduce the number of departures per hour below the limit caused by the weather itself, then the cost of delays is attributable to the bad weather, not the deicing pads.”¹⁵² This is not true. Absent deicing measures, the operational limit imposed by the “weather itself” is zero: FAA regulations preclude operations unless aircraft are deiced in accordance with its strict requirements. The relevant analysis is whether the number of departures using CDPs is lower than the number of departures achievable using other deicing operations (*e.g.*, gate deicing). We believe that both modeling and review of existing deicing throughputs at airports affected under the Proposed Rule would point to the inability of CDPs to maintain this level of throughput. The point, however, is that modeling has not been done and needs to be done to have any reasonable basis on which to evaluate the Proposed Rule’s impact on operations. We provide some examples where this type of analysis has been done in Section 5 below; we provide commonly used cost metrics for assessing the financial dimension of these impacts in Section VI (B)(1).

EPA also says the costs of operational complexities associated with CDPs cannot be evaluated because it has “no means of estimating costs associated with this additional complexity.”¹⁵³ This also is not true. In fact, as pointed out in Section VII (D), in this rulemaking EPA quantified air emissions that would result from increased aircraft taxi and idle times. Air emissions are a direct function of fuel burn – if the Agency could assess the additional emissions associated with the fuel burn, it could assess the additional cost of the fuel itself. Again, modeling of capacity throughput associated with CDPs is one commonly used measure to quantify operational impacts.

EPA also asserts that “[a]lthough some aircraft might be delayed if they lose their spot in the queue, then these costs are offset by the benefit to aircraft that move up in the queue.”¹⁵⁴ This reflects a deep misunderstanding of the nature of delays. Delay is systemic and the impacts of delay cannot be and are not mitigated by removing a single aircraft from the system. EPA’s statement does not make sense on its own terms. The Agency apparently is projecting that the aircraft “loses its place in the queue” because it exceeds its holdover time. Of course, the other aircraft behind this will be operating in the same conditions, likely having passed through the

¹⁵¹ DOT/FAA, *Record of Decision - New York/New Jersey/Philadelphia Metropolitan Area Airspace Redesign [Corrected Version]* at 2 (September 28, 2007).

¹⁵² EA at 4-3.

¹⁵³ EA at 4-3.

¹⁵⁴ EA at 4-3.

same CDP. It follows then, that those aircraft also are likely to exceed their holdover times. Thus, there is no reason to believe that the costs incurred by a misfortunate aircraft that “loses its place in the queue” will be “offset by the benefit to aircraft that move up in the queue.” Further, one aircraft losing its place in line cannot and will not eliminate systemic weather-related delay. That is, even if one aircraft loses its place in line, all other aircraft in the line are still delayed – to the degree delay is caused by or related to use of CDPs in winter conditions, the problem will not be resolved by elimination (temporarily) of a single aircraft from the queue. Again, the question is whether the use of CDPs would cause more or fewer such delays than would the use of other deicing locations during inclement winter weather.

Moreover, there is no basis for the implicit equivalence between the “loss” incurred by the one misfortunate aircraft (which could, for example, require cancellation or the cancellation of other flights as a consequence of its delay) and any (unquantified and purely theoretical) “gains” made by the aircraft remaining in line. In fact, when aircraft begin to exceed holdover times while waiting to depart this can cause huge operational impacts on other departing aircraft which must “give way” to allow the aircraft to return for more deicing, and even to arriving aircraft which may be delayed by the need to taxi on the runway to get around the departure queue. The Agency’s dismissal of delay as a zero sum game leads it to take no account of such real world consequences.

3. EPA Fails to Consider Operational Impacts in Its Analysis of the “Availability” of CDPs

We will not repeat our detailed discussion of this issue in Section VII (A)(2)(a) below, except to reiterate that EPA’s analysis is woefully wanting.

4. EPA Fails to Consider Other Operational Impacts Associated With CDPs

a. Operational Impacts During Construction of CDPs

The record is devoid of any discussion of potential operational impacts related to disruptions that will occur during construction of deicing pads. Indeed, the term “construction” is not once used in the Notice, TDD, EA, or EIB in the context of discussing environmental impacts.¹⁵⁵ However, operational impacts during construction can be extensive as “airside” construction activities necessarily will affect activities. These impacts have several dimensions,

¹⁵⁵ The term appears just twice in the EIB, once to refer to the “Environmental Impact and Benefits Assessment for Proposed Effluent Guidelines and Standards for the Construction and Development Category,” and once to construction of a containment system at CLB. The only time the term is arguably used to refer to impacts associated with construction activities, the reference is oblique at best and certainly does not attempt any quantification or analysis of those impacts. See Notice at 44686 and EA at 4-2 (“A GRV is a modular technology, in that collection capacity can be increased by using additional units, without the complicating factors of in-ground construction associated with some other technologies”).

safety being foremost among them,¹⁵⁶ but also including financial and environmental (*e.g.*, emissions, not only as a result of compromising the efficiency of aircraft or other airside vehicle operations, but of construction activity itself). All of these dimensions must be taken into account in EPA's analysis.

b. Impacts Related to Activities that Support CDP Operations

While it is far preferable to construct dedicated access roadways to ensure deicing trucks and other equipment are able to get to and from pads without using pavement dedicated to aircraft operations, it is possible at some airports these vehicles may need to cross taxiways or runways to access CDPs. Obviously, the associated safety and operational impacts would have to be evaluated in the event this configuration is required.

Even where dedicated roadways are constructed, transit times to and from the CDP, passability of dedicated roadways in winter weather (*i.e.*, the burden associated with keeping them open), underpasses at runways and taxiways that have not been designed with sufficient clearance to accommodate today's increasingly large deicing vehicles, and remoteness from vehicle service, crew rest stations and tankage for ADF and any recovered material all are critical issues that airports studied by the Agency have encountered. Each of these affects the operability and efficiency of a CDP.

Moreover, with the Proposed Rule encouraging airports to press nonpurpose-built areas of tarmac into service as "deicing pads," support functions such as remote aircraft marshaling, aircraft queuing and egress areas, dedicated pad communications systems (visual and radio) and, perhaps, a remote tower must all be provided at locations not originally designed to accommodate them. Operational impacts of any workarounds necessary to re-purpose existing tarmac also qualify as impacts associated with any move to CDP operations. Airports studied by EPA currently are struggling with these operational constraints as well despite the fact that those difficulties are not reflected in EPA's analysis.

5. Impacts on Aircraft Operations Are Routinely Modeled and Quantified – (Necessarily) Preliminary Analysis Indicates the Impacts of Proposed Rule Would Be Substantial

While analysis of the impacts on aircraft operations is both time consuming and resource intensive and, in that sense are anything but routine, the industry routinely performs such analyses, most often in conjunction with major infrastructure projects. Some examples at which such analysis has been done include the Capacity Enhancement Project at PHL, the New York/New Jersey/PHL airspace redesign, and the O'Hare Modernization Plan at O'Hare. That the industry recognizes the need to perform such costly modeling to assess and minimize the operational impacts of major infrastructure projects strongly reflects the reality that operational impacts of CDPs and other technologies that the Agency anticipates will be adopted under the Proposed Rule are real and that their careful assessment is a necessary prerequisite to a sustainable final ELG.

¹⁵⁶ AC 150/5370-2E, *Operational Safety on Airports During Construction* (January 17, 2003).

It is not possible to prejudge the results of any such analysis. However, where – as EPA concedes – constraints on physical space and environmental factors effectively prohibit capacity enhancement projects, we believe any reasonable analysis is very likely to conclude they also effectively prohibit construction of CDPs.

ATA strongly supports such an effort. Specifically, ATA believes that the Agency must – with appropriate assistance from and deference to its expert sister agency, the FAA – ascertain the potential operational impacts associated with the use of CDPs at the major airports targeted under the Proposed Rule. Our purpose here is solely to demonstrate that modeling of operational impacts of the kind routinely performed by the FAA and by the industry itself in such circumstances can and must be incorporated as an element of the record underlying this ELG.

C. EPA Fails to Consider Operational Impacts Associated With GRVs

The Record is devoid of any EPA discussion of potential operational issues related to use of GRVs. However, as pointed out in Section IV(A)(2), above, the efficiency of GRV collection of ADF is closely related to the speed at which they are operated and the number used to provide service, both of which are a function of aircraft operations. The Proposed Rule requires that deicing is limited to areas “where available ADF is *actively* collected by GRVs.”¹⁵⁷ Though EPA has effectively required all aircraft deicing operations to occur in close proximity to “active” GRVs, it asserts that the required ADF collection efficiency is based on “well-operated”¹⁵⁸ collection systems, it has (as detailed in Section VII(B) of these Comments) failed to explain the basis of the required efficiency or what it means to “operate” GRVs “well.” It has thus not even provided a foundation for analyzing operational impacts on aircraft.

D. EPA Fails to Consider Operational Impacts Adequately in Proposing the 25-Gallon Limit Applicable to “Deicing for Safe Taxiing”

Any limit on the use of ADF for “safe taxiing” would effectively limit the number of aircraft operations where the allotted ADF is not sufficient to ensure safe operation of the aircraft. Rather than risk compromising safety, airlines and their pilots would instead cancel any such operation. The Record contains no recognition or analysis of this impact.

While we remain adamant that EPA is without authority to establish any form of limitation with respect to ADF usage, it also is clear that any such limitation would need either to account for the operational cost of these canceled operations or to provide for sufficient non-CDP deicing to assure the safe and lawful operation of all scheduled departures.

VI. EPA’S ANALYSIS OF COSTS IS ARBITRARY AND CAPRICIOUS

The Agency’s analysis of costs is flawed in many distinct respects. This part of our comments is organized as follows:

¹⁵⁷ Proposed §449.20(b)(1)(i)(A) (emphasis added).

¹⁵⁸ Notice at 44690, col.1.

- Section A: Identifies and explains both EPA's misapplication of its own formulas and metrics and its failure to derive its cost metrics consistent with the methodologies the Agency said it used – **these errors alone result in underestimation of about \$1.19 Billion in Capital Costs and of about \$88 Million in Annual Costs**
- Section B: Identifies many cost elements EPA failed to take into account in deriving its metrics, many of which alone would add hundreds of millions to costs, some of which would be prohibitive
- Section C: Identifies and explains further deficiencies in the Agency's methodologies for deriving cost metrics.

A. **The Agency's Misapplication of its Own Cost Metrics and Formulas and Failure to Derive its Metrics Consistent With its Own Methodology Result in an Underestimation of About \$1.19 Billion in Capital Costs and of About \$88 Million in Annual Costs**

As detailed below, these flaws relate to the Agency's failure to correctly apply the metrics and formulas that it purports to apply. That is, even if EPA's metrics and formulas for assessing costs were accepted at face value, errors in their application result in estimated cost impacts that differ materially from those reported in the Record. In addition, many of EPA's metrics and formulas are terribly flawed. Thus, even if EPA applied the metrics and formulas correctly, its cost analysis could not support the Proposed Rule. Together, these flaws lead the Agency to underestimate capital costs to the industry by **at least \$1.19 BILLION**. That translates into an underestimation of **\$87.8 million** in annual costs. These huge errors would be significant in any context – in the context of this Proposed Rule their significance is self-evident. Using its own formulas and metrics, applied and derived as EPA reports they are derived and applied, EPA's estimated:

- Capital costs would rise from \$714 million to about **\$1.9 billion**, an increase of about **167%**
- Annual costs would rise from \$91.3 million to about **\$179.7 million**, an increase of about **96%**

Just as importantly, the vast majority of these costs fall on just six of the large, Tier One airports expected to incur costs under the Proposed Rule. The errors are thus particularly problematic in this rulemaking because the Agency grounded its Economic Analysis on costs incurred at individual airports.

To be clear, the huge underestimation results from two basic mistakes, each accounting for roughly half of the underestimation. The first type of mistake (addressed in Section A, below) is purely arithmetic: EPA simply did not apply its cost metrics properly or used the wrong value when calculating its metric. The primary examples are:

- In calculating CDP Capital Costs, the Agency multiplied its cost metric (\$314.56 / annual departure) by the number of departures during deicing season – As a result, EPA underestimates CDP Capital Costs by over half.
- In calculating AFBR Capital Costs for Tier One Airports, the Agency used a cost metric of \$790/lb COD/day (the COD Load Normalized Cost metric), although the correct value as described and defended at length in the TDD and supporting documentation is \$1659 /lb COD /day.¹⁵⁹ Again, the result is estimated costs are more than 50% less than they should be, even accepting EPA’s asserted methodology.

The second type of mistake (addressed in Section 2, below) also is essentially arithmetic, though perhaps less obvious: EPA did not derive its cost metrics consistent with its own methodology. The primary examples are:

- In calculating its cost-per-departure metric for CDP Capital Costs, EPA failed to account for the fact that CDPs used derive the metric serve far less than 100% of departures at their respective airports.
- In calculating the “COD Load Normalized Cost” metric used to calculate AFBR Capital Costs, EPA failed to include cost elements it claimed were included to calculate the metric’s value – most importantly, EPA did not include over \$10 million in storage tank costs at ALB.

It cannot be emphasized too strongly that these underestimations result from basic errors in deriving and applying EPA’s cost metrics. That is, *even accepting EPA’s asserted premises and assumptions for deriving and applying its cost metrics*, one is compelled to conclude EPA has vastly underestimated costs.

1. The Agency’s Misapplication of Its Own Cost Metrics and Formulas Results in Underestimating Capital Costs by About \$544 Million and Annual Compliance Costs by Over \$45 Million

The Agency’s most obvious error in estimating costs is that it misapplies its own cost formulas when estimating: (1) capital costs for CPDs; (2) annual operation and maintenance (O&M) costs for CDPs; and (3) capital costs for AFBRs at Tier One airports. Again, these underestimates result from EPA’s misapplication of its own cost metrics and formulas. The cost estimates are much larger when items that EPA should have included (itemized and explained in Section VI below) are taken into proper account.

¹⁵⁹ The public at least should be able to take the Agency’s explanations of its methodologies at face value. Various parties may disagree about the validity of those methodologies (and we express such disagreement below), but it is fundamental to the integrity of the notice and comment process that the public should be able to rely on the Agency’s representations of how it reached its conclusions. Certainly, whether the public is able to get to the bottom of an Agency’s analysis should not depend, for example, on whether they are able to discover a “factor” buried in an ACCESS database which itself is only available upon special request from the Agency.

a. **EPA Misapplies Its Own Formula for Estimating Capital Costs for CDPs**

In simplest terms, EPA's error in deriving estimates for the capital costs for CDPs is that it multiplies by the wrong number. In more technical terms, EPA "normalizes" CDP costs on a per-annual-departure basis, but when calculating CPD costs it multiplies the "normalized" figure by the number of deicing season departures. As a result, EPA underestimates capital costs for CDPs by over half.

EPA explains in both the TDD and its supporting memorandum, that "[t]o estimate installed capital costs for deicing pads, EPA normalized the costs based on the number of take-offs during deicing season."¹⁶⁰ The problem is, EPA did not use the number of take-offs during deicing season to derive its "normalized" number, but instead used the number of total annual departures.¹⁶¹ The "normalized" cost per departure, \$314.56, is per annual departure, not per departure during deicing season. Document - 0845, the memorandum presenting the analysis upon which the discussion in the TDD is based, makes this perfectly clear, as does the heading of the extreme right hand column of Table 11-5 in the TDD itself. In addition, a review of the operations data from the airports used as the basis for deriving the metric (CAK, PIT and MSP) also makes this clear – in each case, the total number of annual departures is the number used to derive the metric.

However, when estimating the capital costs of deicing pads at airports, EPA multiplies \$314.56 by the number of departures during deicing season (based on an assumed 5 or 6 month deicing season for each airport¹⁶²), leading it to underestimate the cost by 58% or 50% (again, depending on the assumed length of the deicing season).¹⁶³

¹⁶⁰ TDD at 11-17; Document – 0845 at 2.

¹⁶¹ A review of the aircraft operations data from the airports the Agency uses to derive this metric (CAK, PIT, and MSP) make it apparent that it is based on annual departures, not departures during deicing season.

¹⁶² The length of the deicing season for any given airport is apparently based on the length of the season reported by each airport in its response to the Airport Questionnaire.

¹⁶³ EPA makes plain that the cost metrics are misapplied in deriving the capital (and O&M) costs of CDPs when it applies the cost metric for holding tanks (which is derived in the same way). EPA explains that to derive a formula for estimating holding tank costs it looked at five airports, DIA, CAK, PDX, PIT, and CVG. TDD at 11-28 to 11-29. This explanation recapitulates the explanation laid out in Document – 0853, which also names the airports used to derive the metric. EPA looked at the storage capacity of tanks at the five airports and divided them by the number of annual departures to derive a 24 of storage / departure / year average; looking at total installed capital costs for tanks at three of these airports (DIA, CAK and CVG), then dividing by the total number of annual departures, EPA derived an average cost/ gallon of storage capacity. Notably, the total annual departures for CAK and PIT used to derive these figures are precisely the same as those used to derive the Pad Capital Cost and Pad O&M Cost metrics. When deriving the estimated costs for storage tanks for "Tier 1" airports, EPA multiplies the metric by total annual departures, making no adjustment for the length of the deicing season. Clearly, EPA

Using EWR as an example, the consequences of this error are summarized below:

Calculation of CDP Capital Costs for EWR	
Number of Annual Departures ¹⁶⁴	201,209
Number of Deicing Season Departures (Total Departures x (Deicing Season Months ¹⁶⁵ / 12))	83,837
EPA Estimated Capital Cost ¹⁶⁶ (\$314.56 x 83,837)	\$26,371,793
Capital Cost if Calculated as Described in the TDD (Total Departures x \$314.56)	\$63,292,303
Difference between EPA Estimated Cost and Properly Calculated Cost	\$36,920,510

EPA makes this error for all of the airports projected to have costs associated with installation of CDPs. The results are summarized below¹⁶⁷:

<i>Airport</i>	<i>EPA Estimated Cost (\$314.56 x Deicing Season Departures)</i>	<i>Cost Applying EPA's "Normalized" Cost Properly (\$314.56 x Annual Departures)</i>	<i>Amount of Underestimate Resulting from EPA Misapplication of Metric</i>
BOS	23,208,368	\$55,700,083	\$32,491,715
EWR	26,371,793	63,292,303	36,092,510
IAD*	25,888,713	51,777,425	25,888,713
JFK	22,970,744	45,941,488	22,970,744
LGA	23,806,556	57,135,735	33,329,179
ORD	72,348,014	144,696,027	72,348,014

understood no such adjustment should be made because the metric is based on the cost-per-annual-departures. Just as clearly, no adjustment should have been made when applying the cost-per-annual departure metrics for CDPs. Note that EPA's mistake cannot be corrected merely by re-calculating a metric based on deicing season departures: that metric would be more than twice the value of the per-annual departure metric and, when applied to deicing season departures would yield the same result.

¹⁶⁴ Document – 0631, Column N.

¹⁶⁵ EWR reports the length of its deicing season as 5 months; see EWR (Airport 1145), Response to Question 21 in Airport Questionnaire Database (Document - 1191).

¹⁶⁶ Document - 0634, Column ET.

¹⁶⁷ Note that costs for CLE are NOT included in this summary. It is unclear why EPA estimates costs for CLE when the airport has constructed deicing pads and those pads are currently operating and that EPA explicitly considered using cost data from CLE in CDP costs the inclusion of costs attributed to CLE. Of course, if CLE were included the amount by which EPA underestimates overall costs would be even higher.

TOTAL	\$194,594,187	\$418,453,061	\$223,948,874
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*Calculation applies 1.5 scaling factor applied by EPA.

EPA's underestimate of CDP Capital Costs cause it, in turn, to underestimate the Annualized CDP Capital Costs – using the Agency's formula for calculating annualized costs (using real bond rates reported in Document - 0634 and a 20-year amortization period for CDPs) the underestimations of Annualized CDP Capital Costs are summarized below:

<i>Airport</i>	<i>EPA Estimated Annualized CPD Cost</i>	<i>Annualized Cost of Properly Calculated CDP Capital Costs</i>	<i>Amount of Underestimate Resulting from EPA Misapplication of Metric</i>
BOS	1,433,724	3,440,938	2,007,214
EWR	1,754,104	4,209,849	2,455,745
IAD*	1,828,416	3,656,833	1,828,416
JFK	1,527,885	3,055,770	1,527,885
LGA	1,583,479	3,800,349	2,216,870
ORD	4,714,744	9,429,488	4,714,744
TOTAL	\$12,842,352	\$27,593,228	\$14,750,875

*Calculation applies 1.5 scaling factor applied by EPA.

b. EPA Also Misapplies Its Own Formula for Estimating O&M Costs for CDPs

EPA repeats this error when estimating CDP O&M Costs. Specifically, it derives a per-annual departure metric for estimating CDP O&M Costs, but when it applies the formula the Agency multiplies the metric (\$8.87 per annual departure) by the number of deicing season departures.

Calculation of CDP O&M Costs for EWR	
Number of Annual Departures	201,209
Number of Deicing Season Departures (Total Departures x (Deicing Season Months/12))	83,837
EPA Estimated O&M Cost (\$8.87 x 83,837)	\$743,635
Capital Cost if Calculated as Described in the TDD (Total Departures x \$8.87)	\$1,784,724
Difference between EPA Estimated Cost and Properly Calculated Cost	\$1,041,089

EPA makes this error for all of the airports projected to have costs associated with installation of deicing pads. The results are summarized below:

<i>Airport</i>	<i>EPA Estimated Cost (\$8.87 x Deicing Season Departures)</i>	<i>Cost Applying EPA's "Normalized" Cost Properly (\$8.87 x Annual Departures)</i>	<i>Amount of Underestimate Resulting from EPA Misapplication of Metric</i>
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BOS	654,432	1,570,638	916,205
EWR	743,635	1,784,724	1,041,089
IAD*	730,013	2,190,039	1,460,026
JFK	647,732	1,295,464	647,732
LGA	671,300	1,611,120	939,820
ORD	2,040,078	4,080,156	2,040,078
TOTAL	\$5,487,190	\$12,532,140	\$7,044,950

*Calculation applies 1.5 scaling factor applied by EPA.

c. **EPA Also Misapplies Its Own Formula for Estimating Capital Costs for AFBRs at the Tier One Airports**

The misapplication of its own formula lead EPA to underestimate the capital costs of AFBRs by \$319,000,000. In turn, this mistake leads the Agency to underestimate annual costs by an additional \$18.9 million.

This origin of this huge disparity between the costs that EPA should have derived using its formula and the costs it reported in the TDD, Notice and other record documents is not immediately apparent. This is precisely because the cost estimates EPA reports for each airport cannot be derived using EPA’s formula.¹⁶⁸ Only after extremely detailed review of the record – specifically, detailed analysis to unveil the actual calculations imbedded in the ACCESS databases and ExCel-based economic models – that the source of the disparity becomes clear.

Stated most bluntly: EPA **does not use the cost metric to calculate AFBR costs that it says it uses**. In the TDD and elsewhere, EPA carefully explains the derivation of its cost metric for estimating AFBR capital costs. The Agency reports that based on data from ALB and CAK and careful analysis, the value of this metric, the “COD Load Normalized Cost,” is \$1659 per pound of COD treated per day (\$1690/lb COD/day). However, **when it calculates AFBR capital costs for Tier One airports it uses \$790/lb COD/day**. In fact, EPA only uses the \$1659 value to calculate costs for AFBRs constructed to treat COD collected using GRVs; it uses still another figure (\$1185) to calculated costs of AFBRs constructed to treat COD collected using a “plug and pump” system. These values are listed in the “Factors” table in EPA’s *Airport Deicing Costing Database, Document - 1090*, as “AFBR_DeiceCapCostFactor,” “AFBR_GRVCapCostFactor,” and “AFBR_BlockPumpCapCostFactor.”

There is no rational justification for concluding that the cost of treating COD is dependent on how the COD is collected and EPA provides no such explanation. The most important point, however, is the initial point: EPA’s detailed explanation of its methodology for estimating AFBR capital costs **does not match** the methodology it actually used to calculate these costs.

EPA describes its methodology for estimating Capital Cost of AFBRs in the TDD as follows:

¹⁶⁸ The costs for AFBRs at the Tier One airports are reported in *Document – 0634*, Column GD (entitled “Anaerobic Fluid Bed – Deice Pad Capital Costs”); the costs for AFBRs at the Tier Two airports are reported in Column FF (entitled “Anaerobic Fluid Bed – GRV Capital Costs”).

COD loading is calculated by converting the annual applied ADF (gal/yr) at each airport to average daily COD (lbs/day) throughout the entire deicing season and assuming an ADF collection efficiency based on the selected collection and control technology. COD loading (lbs/day) is then be multiplied by \$1,659/lbs COD/day to determine the installed capital cost.¹⁶⁹

EPA identifies the formula used to calculate these costs in Document – 1100 as:

$$\begin{array}{ccccccccc}
 \text{COD Load} & & & & \text{PG/EG} & & & & \text{ABFR} \\
 \text{Normalized} & & \text{COD} & & \text{Gallons} & & \text{ADF Capture} & & \text{Operating} \\
 \text{Cost} & & \text{pounds/gallon} & & \text{applied per} & & \text{Percentage}^{172} & & \text{Days}^{173} \\
 (\$/\text{lbs./day}) & & \text{ADF}^{170} & & \text{deicing} & & & & \\
 & & & & \text{season}^{171} & & & & \\
 \\
 \$1659 & \times & 14.38 & \times & \text{Airport's} & \times & \text{Airport's ADF} & \times & 1/\text{Airport's} \\
 & & & & \text{Applied ADF} & & \text{Capture} & & \text{ABFR} \\
 & & & & & & \text{Percentage} & & \text{Operating} \\
 & & & & & & & & \text{Days}
 \end{array}$$

However, the ACCESS database in which the actual calculations shows that the values for individual airports reported in its Airport Cost Model were calculated as follows:

<i>Airport</i>	<i>COD Load Normalized Cost (\$)</i>	<i>x</i>	<i>Pounds COD / Gallon</i>	<i>x</i>	<i>Capture Rate (%)</i>	<i>x</i>	<i>Applied ADF</i>	<i>x</i>	<i>1/AFBR Operating Days</i>	<i>=</i>	<i>COST</i>
BOS	790	<i>x</i>	14.28	<i>x</i>	60%	<i>x</i>	995,249	<i>x</i>	1/150	<i>=</i>	44,910,401
EWR	790	<i>x</i>	14.28	<i>x</i>	60%	<i>x</i>	1,123,057	<i>x</i>	1/150	<i>=</i>	50,677,735
IAD*	790	<i>x</i>	14.28	<i>x</i>	60%	<i>x</i>	1,076,083	<i>x</i>	1/120	<i>=</i>	91,046,307
JFK	790	<i>x</i>	14.28	<i>x</i>	60%	<i>x</i>	560,031	<i>x</i>	1/180	<i>=</i>	21,059,390
LGA	790	<i>x</i>	14.28	<i>x</i>	60%	<i>x</i>	485,157	<i>x</i>	1/150	<i>=</i>	21,892,624
ORD	790	<i>x</i>	14.28	<i>x</i>	60%	<i>x</i>	1,516,626	<i>x</i>	1/180	<i>=</i>	57,031,211
GRAND TOTAL COST											\$286,168,563

*Calculation applies 1.5 scaling factor applied by EPA.

¹⁶⁹ TDD at 11-23.

¹⁷⁰ This is a constant based on “the molecular formula of the chemical and the stoichiometric equation of the breakdown of the chemical with the end products of carbon dioxide and water.” Document -1107 at 12-13. Here, the value for PG is used. While, this value is higher than the value for EG, it does not make a material difference in calculation of AFBR costs for Tier One airports incurring costs because these airports all use 100% PG, with the exception of LGA, which uses 97% PG and 3% EG. Table 1, Document - 1107.

¹⁷¹ The specific value for each airport is listed in Table 1, Document - 1107.

¹⁷² This varies depending on the type of collection method: 60% for Tier One (CDP) Airports and 20% for Tier Two (GRV) Airports.

¹⁷³ “[T]he deicing season operating data [is] obtained from the survey database.” Document - 1107 at 16. The specific value used for a given airport depends on which months airports indicated are months in which there is in response to Question 21 of the Airport Deicing Survey.

The shaded columns indicate values that do not match the values EPA says it used to estimate AFBR costs. Most important is the disparity between the \$790 value the Agency actually used for the COD Load Normalized Cost and the \$1659 value it said it used to calculate costs. (The use of the 14.28 value instead of the 14.38 value appears to be a typo) It is clear, however, that these are the costs that EPA used in its Airport Cost Model and are the basis for its cost estimate for the industry and individual airports.

<i>Airport</i>	<i>Cost Calculated Using Incorrect \$790 Metric</i>	<i>Cost Reported by EPA</i>	<i>Difference</i>
BOS	44,910,401	44,461,297	449,104
EWR	50,677,735	50,677,735	0
IAD*	91,046,307	91,046,307	0
JFK	21,059,390	21,059,390	0
LGA	21,892,624	21,892,624	0
ORD	57,031,211	57,031,211	0

(It is not clear what the root of the 1% difference in costs for BOS is.)

Applying EPA's formula properly – that is, using the \$1659 value for COD Normalized Cost it said it used and the only such metric for which it has any supporting analysis and the 14.38 for Pounds COD value – yields the following for each of the Tier One airports expected to incur costs under this rule:

<i>Airport</i>	<i>COD Load Normalized Cost (\$)</i>	<i>x</i>	<i>Pounds COD / Gallon</i>	<i>x</i>	<i>Capture Rate (%)</i>	<i>x</i>	<i>Applied ADF</i>	<i>x</i>	<i>1/ AFBR Operating Days</i>	<i>=</i>	<i>COST</i>
BOS	1659	x	14.38	x	60%	x	995,249	x	1/150	=	94,972,289
EWR	1659	x	14.38	x	60%	x	1,123,057	x	1/150	=	107,168,504
IAD*	1659	x	14.38	x	60%	x	1,076,083	x	1/120	=	192,536,160
JFK	1659	x	14.38	x	60%	x	560,031	x	1/180	=	44,534,416
LGA	1659	x	14.38	x	60%	x	485,157	x	1/150	=	46,296,461
ORD	1659	x	14.38	x	60%	x	1,516,626	x	1/180	=	120,604,237
GRAND TOTAL COST											\$606,112,066

*Calculation applies 1.5 scaling factor applied by EPA.

The chart below compares these costs, calculated using EPA's formula, with the cost estimates reported by EPA.

<i>Airport</i>	<i>EPA Reported Cost</i>	<i>Cost Calculated Using Formula</i>	<i>Difference</i>
BOS	44,461,297	94,972,289	50,510,992
EWR	50,677,735	107,168,504	56,490,769
IAD*	91,046,307	128,357,440	101,489,853
JFK	21,059,390	44,534,416	23,475,026
LGA	21,892,624	46,296,461	24,403,837
ORD	57,031,211	120,604,237	63,573,026
TOTAL	\$286,168,563	\$606,112,066	\$319,943,503

*Calculation applies 1.5 scaling factor applied by EPA.

Thus, using the methodology and values EPA defends in its supporting analyses and those it reports using, EPA underestimates costs by \$320 million. This translates into about \$23.5 million in additional annualized capital costs, as summarized in the chart below:

<i>Airport</i>	<i>EPA Estimated Annualized AFBR Capital Cost</i>	<i>Annualized Cost of Properly Calculated AFBR Capital Cost</i>	<i>Difference</i>
BOS	2,746,649	5,867,025	\$3,120,376
EWR	3,370,799	7,128,248	\$3,757,449
IAD	4,286,825	13,598,061	\$9,311,236
JFK	1,400,753	2,962,180	\$1,561,427
LGA	1,456,175	3,079,381	\$1,623,206
ORD	3,716,585	7,859,485	\$4,142,899
TOTAL	\$16,977,785	\$40,494,380	\$23,516,594

d. **Together, EPA’s Errors in Applying Its Own Metrics and Formulas for Estimating Costs of the Proposed Rule Result**

The combined effect of the errors discussed above is summarized in the chart below:

Difference in Estimated Costs When EPA Metrics and Formulas Are Properly Applied

<i>Airport</i>	Capital Costs			Annual Costs			
	<i>CDPs</i>	<i>AFBR</i>	<i>Total</i>	<i>CDPs Annualized Capital Costs</i>	<i>CDPs O&M Costs</i>	<i>AFBRs Annualized Capital Costs</i>	<i>TOTAL</i>
BOS	32,491,715	50,510,992	83,002,707	2,007,214	916,205	3,120,376	6,043,796
EWR	36,092,510	56,490,769	93,411,279	2,455,745	1,041,089	3,757,449	7,254,284
IAD	25,888,713	101,489,853	127,378,566	1,828,416	1,460,026	4,778,549	8,066,991
JFK	22,970,744	23,475,026	46,445,770	1,527,885	647,732	1,561,427	3,737,044
LGA	33,329,179	24,403,837	57,733,016	2,216,870	939,820	1,623,206	4,779,897
ORD	72,348,014	63,573,026	135,921,040	4,714,744	2,040,078	4,142,899	10,897,721
TOTAL	\$223,948,874	\$319,943,503	\$543,892,377	\$14,750,875	\$7,044,950	\$23,516,594	\$45,312,419

2. **The Agency’s Failure to Derive Its Cost Metrics Consistent With Its Own Methodologies Results in Further Underestimation of Costs**

To reiterate, the errors noted in Section 1, above, reflect the underestimates that result simply from EPA misapplying its own metrics and formulas for estimating compliance costs that would be incurred under the Proposed Rule. That analysis does NOT reflect the further

underestimation of costs that results from EPA's failures to derive the metrics consistent with its stated methodologies for doing so.

a. **EPA Does Not Derive Its Metric for CDP Capital Costs Consistent With Its Own Methodology**

EPA estimates CDP Capital Costs using the \$314.56 per annual departure metric discussed above. EPA derives this metric for using data from three airports: CAK, PIT and MSP.¹⁷⁴ We describe many problems with EPA's selection of these data and rejection of other data in Section VI (C)(3)(a), below. Here we discuss the fact that EPA did not derive this metric consistent with the methodology that it describes.

This metric is intended to allow EPA to estimate the cost of deploying CDPs at all airports. Importantly, EPA has affirmed that the 60% ADF collection standard is based on its estimate of the performance of CDPs, the Tier One model BAT collection technology, and Tier One airports can achieve compliance with the proposed BAT by running 100% of deicing operations through CDPs; EPA also has confirmed that its *cost model* assumes that Tier One airports will deploy CDPs to service 100% of deicing operations.¹⁷⁵ EPA's derivation of the \$314.56/ annual operation metric is not consistent with this affirmed parameter.

The Agency uses MSP as one of the airports from which it derives its metric for estimating pad costs, but notes in its own report that during its site visit "[a]irport staff stated that 70% of all deicing fluid is applied on the airport's four deicing pads. The remaining 30% of deicing operations are done in the plug and pump area or the cover and sweep areas."¹⁷⁶ Using the departure level attributed to MSP (246,286¹⁷⁷), the number of departures serviced at deicing pads can be calculated: 70% of 246,286 = 172,400. Dividing the costs attributed to these pads by the Agency (\$79,300,000) by this number of departures produces a per-departure cost of deicing pads at MSP of \$460/departure, not the \$322 calculated by the Agency.

The Agency also uses PIT as one of the airports from which it derives this metric. Based on cost data on three CDPs at PIT (pads Charlie, Echo and Sierra), EPA concludes the per-annual departure cost of CDPs at PIT is \$280. However, two other CDPs – the "FBO Pad" and the "FedEx Pad" – also are commonly used at PIT; three others also play a role in ADF collection at the airport. Analysis of ADF collection data from PIT reveals that the Charlie, Echo, & Sierra pads (Pads C, E & S) that form the basis of EPA's \$280/annual departure account for just 65% of ADF collected at the airport. While not perfect, scaling up \$280 as if Pads C, E & S represented

¹⁷⁴ While EPA does not identify these as the airports in its TDD discussion (at 11-17), it is plain from Document - 0845 that these are the airports from which it drew its data. Compare Table 1 in Document - 0845 with Table 11-5 in the TDD.

¹⁷⁵ Telephone conference between Tim A. Pohle, ATA and Eric Strassler, EPA (February 2, 2010). See also Notice at 44868 ("EPA estimates that central deicing pads allow airports to capture about 60 percent of the available ADF").

¹⁷⁶ *Final Engineering Site Visit Report for Minneapolis-St. Paul International Airport, Minneapolis, MN* at 5 (January 24, 2008).

¹⁷⁷ Document - 0845 and TDD at 11-17.

100% of collected ADF¹⁷⁸ (by solving for “x” in the following equation: $\$280/65\% = x/100\%$) yields a value of \$431/annual departures at PIT.¹⁷⁹

Using the \$460 figure for MSP and the \$431 figure for PIT as bases for deriving the per-annual departure cost metric, the result is \$411/departure (*i.e.*, the average of the value calculated for CAK (\$342), PIT (\$431) and MSP (\$460)).¹⁸⁰ Thus, *when the per-annual departure metric is derived consistent with EPA’s asserted methodology, it is 31% higher than the \$314.56 metric that EPA used in its cost calculations.* Using the metric derived consistent with EPA’s asserted methodology and properly applying EPA’s cost formula (to all departures rather than only deicing season departures) pad capital costs results in the following:

<i>Airport</i>	<i>EPA Estimated CDP Capital Cost</i>	<i>Cost Applying Metric Derived Consistent With EPA’s Methodology Properly (\$431 x Annual Departures)</i>	<i>Amount of Underestimate Resulting from EPA Misapplication of Metric</i>
BOS	23,208,368	76,318,463	53,110,095
EWR	26,371,793	86,721,079	60,349,286
IAD	25,888,713	70,943,764	45,055,051
JFK	22,970,744	62,947,550	39,976,806
LGA	23,806,556	78,285,547	54,478,991
ORD	72,348,014	198,257,845	125,909,831
TOTAL	\$194,594,187	\$573,474,248	\$378,880,061

When annualized (using the airport-specific ratios for capital and annualized capital costs) the costs for each airport are as follows:

<i>Airport</i>	<i>EPA Estimated Annualized CDP Capital Cost</i>	<i>Annualized Cost of Properly Calculated CDP Capital Cost</i>	<i>Difference</i>
BOS	1,433,724	4,714,663	3,280,939
EWR	1,754,104	5,768,200	4,014,096
IAD	1,828,416	5,010,475	3,182,058

¹⁷⁸ This, essentially, mirrors the assumption at the foundation of the CDP Capital Cost and CDP O&M Cost metrics: that the cost of achieving compliance with BAT through deployment of CDPs at one airport can be applied linearly across airports or, as here, within an airport.

¹⁷⁹ Data from PIT indicates that only about 70% of deicing operations are served by Pads C, E & S, with the remainder served by the FBO and FedEx pads; as noted below, GRVs account for about 10% of ADF collected at PIT. Another problem with the derivation of the \$280 value at PIT is that it is not, as intended, expressed in 2006\$. Still further, it does not include design and engineering costs that would add another 15%.

¹⁸⁰ The figures for CAK and PIT also are flawed. The costs used to calculate the value for PIT, for example, do not include study/design costs at a minimum. In addition, if calculated on the basis of current departure levels the figures for each airport would be even higher (because total departures are lower today than in previous years).

JFK	1,527,885	4,186,918	2,659,033
LGA	1,583,479	5,207,116	3,623,637
ORD	4,714,744	12,919,981	8,205,237
TOTAL	\$12,842,352	\$37,807,354	\$24,965,001

b. **EPA Does Not Derive Its Metric for Capital AFBR Costs Consistent With its Own Methodology – Resulting in Further Underestimation of AFBR Capital Costs**

At the time the Agency was developing cost metrics for purposes of estimating AFBR Capital Costs, data were available for only two airports ALB and CAK – the only two airports which had operated and/or planned to operate an AFBR treatment system. Even with this extremely limited universe of data, EPA makes a huge error in assessing costs and therefore in deriving its cost metric for AFBRs. In short, the Agency concludes the total installed capital cost of the ALB system is \$8.1 million (2006\$), when – if calculated consistent with the Agency’s own description of its calculation methodology – the correct value is \$24.31 million (2006\$).

EPA’s description of its methodology for deriving the AFBR Capital Cost metric from the TDD is reproduced below¹⁸¹:

Two airports have provided installed capital and O&M costs for AFBR biological treatment systems to treat ADF-contaminated stormwater (ERG, 2007g; ERG, 2007h). Table 11-10 lists the load and flow-normalized installed capital costs for the both AFBR treatment systems. *The costs shown in Table 11-10 include costs for storage equipment such as tanks and ponds prior to anaerobic treatment.* The storage equipment provides sufficient equalization to dampen flow and concentration changes indicative of deicing events.

EPA clearly states that its metric for calculating AFBR capital costs is intended to “include costs for storage equipment such as tanks and ponds” and, for ALB, costs were based on information contained in Document - 0806.¹⁸² The relevant portion of the later document is excerpted below:

¹⁸¹ TDD at 11-23 (emphasis added).

¹⁸² EPA cites “ERG, 2007g” as the source of the ALB information; the references section of TDD Chapter 11 identifies “ERG, 2007g” as “Personal communication (email) between Mary Willett (ERG) and Mark Sober (Albany International Airport). (December 12). DCN AD00865 and AD00866.” DCN AD00865 and AD00866 are included in the record as Document - 0805 and Document - 0806, respectively; they include data ALB-submitted data on annual O&M costs (Document - 0805) and Capital Costs (Document - 0806).

Camp, Dresser & McGee	1995-97	SPDES/TIP MONITORING & ANALYSIS	\$148,918				
ACAA Maintenance	1991-Present	APRON & SYSTEM TIME & MATERIAL	\$206,110				
Clough, Harbour & Assoc.	1993-6	SPDES PERMIT MONITORING	\$26,100				
Clough, Harbour & Assoc.	1991	PG CONTAINMENT E/A	\$838,820				
Chester Environmental	128	CHESTER-LWD RELOCATION ENG.	\$12,113				
Maloy/TCB	204-IC	APRON COLLECTION REHAB EAST	\$3,640,639				(67% pro-rated contract for apron/drainage imp's.)
Kubricky Construction Co.	66A	APRON COLLECTION REHAB WEST	\$1,051,643				(67% pro-rated contract for apron/drainage imp's.)
Zenon/Coastal Fluid Tech	34	CONTAINMENT & COLLECTION (1995)	\$237,263				through '95 only
August Bohl Contracting	1991	STORAGE LAGOON DN./CONSTRUCT.	\$10,750,070				
Whitman, Hanna, Ost...	31	DEC CONSENT ORDER LEGAL Rvw.	\$6,025				
Baron Utilities Inc.	115A	REHAB 2.2 MG LAGOON	\$85,325				
Clough, Harbour & Assoc.	115	REHAB 2.2 MG LAGOON DESIGN	\$9,179				
Statewide Aquastore, Inc.	280-AGT	2.5 M GALLON ABOVE GRADE TANK	\$1,231,485				
EGM Electric (1998)	280-E	DEICING COLLECTION SYSTEM IMP.	\$373,469				
August Bohl Contracting	280-GC	DEICING COLLECTION SITEWORK	\$1,188,477				
FPI Mechanical (1998)	280-PGT	GACFBR TREATMENT PLANT	\$3,281,000				
		REPAIRS TO INFILTRATION SYSTEM	\$441,100				
		COLLECTION & RECYCLING TANKS	\$17,200				
		TELEPHONE CABLE INSTALLATION	\$4,038				
		GUAGE FOR COLLECTION TANK	\$2,500				
		CHA ENGINEERING FEE/Preliminary	\$5,000				
		CHA DESIGN FEES	\$32,000				
		AMENDMENT/CONSTRUCTION SERVICE	\$377,074				
		AMENDMENT/INFILTRATION/INFLOW	\$52,700				
		AMENDMENT/CI COMPLETION	\$20,606				
		BOND COUNSEL EXPENSES	\$35,000				
		MISCELLANEOUS	\$12,879				
		EQUIPMENT/ PG VACUUM TRUCK	\$249,075				
		INSURANCE	\$105,000				
		CONTINGENCY	\$71,398				
		CAPITAL & MISCELLANEOUS SUBTOTAL	\$24,512,206				

While it is not clear from the cited Document - 0806 precisely what elements of EPA included in the \$8.1 million (\$6.86 million in \$2001),¹⁸³ it is clear that EPA did not include, as the Agency asserts, all “costs for storage equipment such as tanks and ponds”/ “wastewater storage” costs. Document – 0806 clearly lists “Storage Lagoon [Design]/Construct[ion]” as an element costing \$10.75 million in 1991.¹⁸⁴ This is not an inconsequential oversight: the AFBR system EPA is purporting to cost cannot function at ALB without the storage lagoons constructed in 1991. EPA’s Engineering Site Visit Report makes this clear, noting that one of the lagoons is actually the “feeder” for the AFBR to ensure influent to the system is properly calibrated:

¹⁸³ EPA’s description of its methodology for deriving the metric for AFBR Capital Costs is consistent with the description provided in Document - 0843, which explains that the \$8.1 million capital cost figure attributed to ALB was “verbally provided by Mark Sobel during the Albany Sampling Episode” and “[c]osts were escalated by 18.07 percent to adjust costs from 1999 dollars to 2006 dollars using Bank of Canada Consumer Price Index Calculator (http://www.bankofcanada.ca/en/rates/inflation_calc.html).” Document - 0843, n.3. Thus, the \$8.1 million in 2006 dollars is equivalent (according to EPA) to \$6.86 million in \$2001.

¹⁸⁴ We realize that the Agency includes “tank” costs as one element of its overall estimate of capital costs for airports. There are several reasons that is not relevant here. Most importantly, as explained in greater detail below, the tank cost metric is manifestly inadequate. In fact, **no** airport is projected to incur tank costs even close to the level of costs incurred at ALB, a relatively small airport. Indeed, the most any airport expected to incur costs under the Proposed Rule is projected to need to spend on tanks is the \$7.6 million in 2006\$ CLT is expected to spend considerably less than the \$10+ million in 1991\$ spent by ALB. See Document - 0634 at sheet “CstAnnual,” Column DV. (Note there is an unexplained 0.33 “scaling factor” applied to tank costs at Tier One airports, cutting the effective values for expected tank costs listed in Column DV for these airports by 67%).

Stormwater storage units include a 6-million gallon lagoon, a 2.5-million gallon lagoon (called “feed storage lagoon” by Albany staff), and a 2.5-million gallon above-ground cobalt-fused steel tank. The primary purpose of the storage units is to equalize the wastewater to provide a stable influent for subsequent onsite wastewater treatment. . . . Wastewater from the smaller stormwater storage lagoon comprises the influent to wastewater treatment. Wastewater is pumped from the larger storage lagoon and from the storage tank to the smaller storage lagoon for treatment.¹⁸⁵

Indeed, EPA’s *Sampling Episode Report* for ALB (July 19, 2006)¹⁸⁶ provides a schematic that makes plain the role the storage lagoons play in the ALB treatment system is critical:

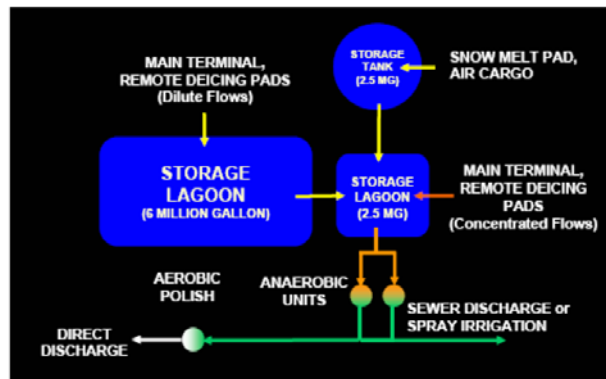


Figure 2-1. Stormwater Management Scheme for Albany International Airport (provided by ALB)

It is thus apparent that EPA at least omitted the cost of storage provided by the lagoons at ALB. The cost of these lagoons is listed in Document - 0806 as \$10.75 million in 1991 dollars; that is equivalent to \$14.09 million in 2006 dollars (using the same Bank of Canada calculator cited by EPA).¹⁸⁷ In its latest approved Operating Budget, ALB details the original cost of its treatment system as follows:

In July 1998, the Authority, through the New York State Environmental Facilities Corporation (EFC) received \$7.5 million

¹⁸⁵ Document - 0520 at 7.

¹⁸⁶ Document - 0731.

¹⁸⁷ As reported in its latest approved operating budget, ALB is contemplating the replacement of the lagoons with new tanks at a projected cost of at least \$10 million. *Albany County Airport Authority – Operating Budget 2009 (Adopted December 1, 2008)* at 9-13 (document available here: <http://www.albanyairport.com/FileUpload/files/ACAABUDGET09.pdf>):

G. Glycol Storage Tank Expansion - \$10 Million

Glycol is currently held in lagoons which are subject to the capture of rain water. The recommended method is to utilize large expansion tanks to contain the glycol for processing.

Series A bonds to finance the total construction of a new glycol wastewater treatment system. In July 1999, the loan was replaced by \$7,895,303 bonds issued by the EFC . . .¹⁸⁸

Using the same Bank of Canada calculator used by EPA, the \$7.9 million total costs (1999\$) reported by ALB for its treatment system are equivalent to \$9.22 million in 2006\$. Thus, “includ[ing] both wastewater storage and treatment equipment” as EPA indicates it intends to do, total ALB costs are \$24.31 million in 2006 dollars. This is three times the costs assumed by EPA for purposes of deriving its AFBR Capital Cost metric.

Had EPA thus included all of the capital costs associated with the ALB system when deriving its per-annual departure metric for estimating AFBR capital costs, its calculation would be as follows:

<i>Airport</i>	<i>COD Loading (lbs./day)</i>	<i>Installed Capital Cost (2006\$)</i>	<i>COD Load- Normalized Capital Cost (\$/lbs. COD/day)</i>
ALB	5,200	24,310,000	\$4,675
CAK	3,400	5,990,000	\$1,761
Average			\$3,218

The effect of EPA’s failure to calculate its cost metric consistent with the methodology as described in the TDD (and support Document - 0843) is dramatic; the properly calculated \$3,218 metric is:

- Over **FOUR TIMES** more than the \$790 EPA used to calculate AFBR costs for Tier One Airports; and
- 94% higher than the \$1,659 EPA used to calculate AFBR costs for Tier Two Airports

The chart below summarizes, for Tier One airports expected to incur costs under the Proposed Rule, the capital costs of AFBRs calculated using the derived COD Load Normalized Cost metric derived consistent with EPA’s asserted methodology:

<i>Airport</i>	<i>COD Load Normalized Cost (\$)</i>	<i>x</i>	<i>Pounds COD / Gallon</i>	<i>x</i>	<i>Capture Rate (%)</i>	<i>x</i>	<i>Applied ADF</i>	<i>x</i>	<i>1/ AFBR Operating Days</i>	<i>=</i>	<i>COST</i>
BOS	3218	x	14.38	x	60%	x	995,249	x	1/150	=	184,219,907
EWR	3218	x	14.38	x	60%	x	1,123,057	x	1/150	=	207,877,182
IAD*	3218	x	14.38	x	60%	x	1,076,083	x	1/120	=	248,977,843
JFK	3218	x	14.38	x	60%	x	560,031	x	1/180	=	86,384,419
LGA	3218	x	14.38	x	60%	x	485,157	x	1/150	=	89,802,298

¹⁸⁸ Albany County Airport Authority – Operating Budget 2009 (Adopted December 1, 2008) at 9-2 (document available here:

<http://www.albanyairport.com/FileUpload/files/ACAABUDGET09.pdf>).

ORD	3218	x	14.38	x	60%	x	1,516,626	x	1/180	=	233,938,778
GRAND TOTAL COST											\$1,051,200,427

*Calculation applies 1.5 scaling factor applied by EPA.

The chart below compares these costs, calculated using the properly-derived COD Load Normalized Cost Metric \$3,218, with the cost estimates reported by EPA.

<i>Airport</i>	<i>EPA Reported Cost</i>	<i>Cost Calculated Using Formula</i>	<i>Difference</i>
BOS	44,461,297	184,219,907	139,758,610
EWR	50,677,735	207,877,182	157,199,447
IAD*	91,046,307	248,977,843	157,931,537
JFK	21,059,390	86,384,419	65,325,029
LGA	21,892,624	89,802,298	67,909,674
ORD	57,031,211	233,938,778	176,907,568
TOTAL	\$286,168,563	\$1,051,200,427	\$765,031,864

*Calculation applies 1.5 scaling factor applied by EPA.

The resulting underestimation of Annualized AFBR Capital Costs for Tier One Airports is summarized below:

<i>Airport</i>	<i>EPA Estimated Annualized AFBR Cost</i>	<i>Annualized Cost of Properly Calculated AFBR Capital Costs</i>	<i>Amount of Underestimate Resulting from EPA Misapplication of Metric</i>
BOS	2,746,649	11,380,403	8,633,753
EWR	3,370,799	13,826,825	10,456,026
IAD	4,286,825	17,584,312	13,297,487
JFK	1,400,753	5,745,807	4,345,055
LGA	1,456,175	5,973,145	4,516,971
ORD	3,716,585	15,245,221	11,528,636
TOTAL	\$16,977,785	\$69,755,713	\$52,777,927

*Calculation applies 1.5 scaling factor applied by EPA.

The chart below summarizes the effect of EPA's failure to derive the AFBR cost metric consistent with its methodology on its cost estimates:

<i>Airport Type</i>	<i>EPA Estimated Cost</i>	<i>Cost Using Metric Derived Using EPA Methodology</i>	<i>Difference</i>
Capital Costs			
Tier One	286,168,563	1,051,200,427	765,031,864
Tier Two*	47,548,409	92,864,517	45,316,108
TOTAL	\$333,716,972	\$1,144,064,944	\$810,347,972
Annualized Capital Costs			
Tier One	16,977,785	69,775,713	52,777,927

Tier Two*	4,544,162	6,212,516	3,031,603
TOTAL	\$21,521,947	\$75,988,229	\$55,809,530

* Calculated accounting for EPA survey weights (e.g., ROA survey weight = 2.1921); Annualized costs calculated using same PMT formula as for CDPs.

The bottom line is that if EPA derived its cost metric for AFBR Capital Costs consistent with the methodology it asserts was used to derive the metric, the estimate for capital costs imposed under the Proposed Rule would have been \$285 million higher and its estimate of annualized capital costs would have been \$20.2 million higher.

3. The Combined Impact of EPA’s Calculation Errors is Huge – Both on its Analysis of Industry-Wide Impacts and Impacts to Individual Airports

The combined effect of the errors discussed above is summarized in the chart below:

Difference Between EPA Estimated Costs and Costs When EPA Formulas Are Properly Applied Using EPA Metrics Derived Consistent With EPA Methodology

Capital Costs			Annual Costs			
CDPs	AFBRs	Total	CDPs Annualized Capital Costs	CDPs O&M Costs	AFBRs Annualized Capital Costs	TOTAL
\$378,880,061	\$810,347,972	\$1,189,228,033	\$24,965,001	\$7,044,950	\$55,809,530	\$87,819,481

All told, the bottom line is that if EPA estimated the costs of this Proposed Rule properly applying its own formulas and deriving its own cost metrics consistent with the methodology the Agency purports to use, its estimate of total capital costs would have been **\$1.19 billion higher** and its estimate of annualized costs would have been **\$87.8 million higher**. Errors of this magnitude are significant in any context. In the context of this rulemaking, however, they are huge. Using its own formulas and metrics (properly applied and derived), EPA’s estimated

- Capital costs would rise from \$714 million to about **\$1.9 billion**, an increase of about **167%**
- Annual costs would rise from \$91.3 million to about **\$179.7 million**, an increase of about **96%**

Even more centrally in this rulemaking, the large majority of the costs imposed under this rule fall on just six airports, BOS, EWR, IAD, JFK, LGA and ORD. The fact that costs are in fact much, much larger than EPA reports in its Notice greatly impacts EPA’s Economic Analysis. For that analysis, EPA compares costs to total operating revenue (using the “Revenue Test”). Had the Agency properly applied its cost metrics and formulas, total compliance costs for these airports would rise dramatically and, in turn, affect the results of that test. In short,

EPA cannot possibly conduct its Economic Analysis consistent using its current cost estimates for each airport as its basis.

It cannot be emphasized enough that these errors are the result of EPA's failure to estimate costs consistent with its own asserted basis for estimating those costs. We also believe that EPA has failed to take many elements of costs incurred under the Proposed Rule into account – including elements that are cost prohibitive. When these elements are included, any reasonable estimate of the costs imposed under the Proposed Rule skyrocket still further. We address this issue in the following section.

B. EPA Fails to Identify and Include Many Costs, Many of Which Alone Would Add Hundreds of Millions of Dollars to Estimated Costs

While concerned generally about EPA's failure to identify and include many cost elements in its analysis, some of which are – as detailed below – very large, ATA especially is concerned that EPA has failed to address costs that fall exclusively on airlines. While EPA maintains that it need not address the economic impact of the Proposed Rule on airlines, as discussed below in Section XI(D)(1), this is based on an incorrect understanding of NPDES permitting as it applies in this industry. In short, airlines hold separate permits from airports and are subject to enforcement of those permits – even as co-permittees airlines are subject to enforcement. As a result, the Proposed Rule would impact airlines directly and EPA is legally obligated to assess its economic impact on airlines.

While EPA purports to analyze impacts to airlines by assuming (under one scenario) that costs imposed on airports will be passed through in their entirety to airlines, even if this analysis were adequate (which, as we explain below, it is not), it would not adequately address impacts to airlines. This is because there are costs that EPA does not assess that will fall exclusively on airlines. The cost associated with operational impacts is a key example: the added fuel, labor and other costs incurred by airlines as a result of operational inefficiencies imposed under the Proposed Rule fall exclusively on airlines. This potentially massive cost is not captured by an analysis focused on airport costs, even if it is assumed that 100% of these costs are passed through to airlines (as we believe they are). So too, while experience varies at some airports, airlines participate directly and extensively in planning and evaluating major infrastructure projects – this is especially true with respect to airports that are especially important to a certain carrier or group of carriers. Several airports that would be most affected under this proposal fit that mold (*e.g.*, ORD, BOS, JFK, LGA, EWR and IAD, in addition to other Tier Two airports). EPA makes no attempt, for example, to assess the costs associated with attending meetings that often span years and contracting for services to evaluate independently projects at airports that are critical to an airline(s) business. In addition, EPA makes no attempt to evaluate the incremental cost to airlines of operating deicing operations that are far more elaborate and intricate than the operations that would otherwise be performed. All of this takes increased employee training, likely more employees and likely increased salaries for more highly skilled workers.

Without assessing such costs and including them in its assessment of overall costs, EPA has not begun to capture the real magnitude of costs that would be imposed under this proposal.

1. **EPA Fails to Include Costs Associated With Potential Operational Impacts of Its Rule**

As explained in Section V, above, the Agency fails to undertake any reasonable analysis of the potential for the Proposed Rule to impact aircraft operations at airports and throughout the NAS. The record is devoid of any analysis of costs associated with operational impacts.

EPA must address such costs and must do so in at least two ways. First, the Agency already has – in the context of evaluating air emissions – assumed increased taxiing times and fuel burn associated with use of CDPs.¹⁸⁹ Increased taxiing times represents the bare minimum basis for evaluating operational costs associated with use of CDPs. More importantly, any policy or program that could have the effect of increasing congestion and delays at airports clearly has the potential to impose huge costs on the industry and consumers. While analyzing the extent to which – or even whether – this rulemaking will have the effect of increasing congestion and delays at particular airports and if so, the broader effect on the NAS, requires extensive time and resources, it is clear the Agency must address the issue. The elements of any analysis of costs associated with increased operating times (whether or not they result from delay) include (without limitation) the following:

Direct and Indirect Aircraft Operating Costs: Aircraft operations entail certain costs which can then be estimated on a per-block-time (airborne time plus taxi time). For 2008, the most current calendar year for which data is available, these costs can be broken down as follows¹⁹⁰:

<i>Cost Center</i>	<i>Direct Aircraft Operating Cost per Block Minute</i>
Fuel	40.94
Crew – Pilots/Flight Attendants	13.31
Maintenance	10.18
Aircraft Ownership	7.79
Other	1.87
TOTAL	74.10

¹⁸⁹ Notice at 44710; TDD at 12-4 to 12-7.

¹⁹⁰ <http://www.airlines.org/economics/cost+of+delays/>. The less efficient the air transportation system, the more aircraft, personnel and landside facilities airlines require to provide services. As a report from the U.S. Senate Joint Economic Committee Majority Staff points out:

DOT points out in its analytic guidance, if “. . . an initiative improves system efficiency, an operator may be able to provide the same service with fewer aircraft.” Likewise a system with greater delays requires more aircraft to provide a given level of service, along with flight attendants, more general personnel, and other factors of production.

Joint Economic Committee Majority Staff, U.S. Senate, *Your Flight Has Been Delayed Again – Flight Delays Cost Passengers, Airlines, and the U.S. Economy Billions* at A12 (May 2008) (quoting GRA *Economic Values* at 4-1) (hereafter “JEC Report”).

Measurement Metric: the estimated average cost of an airline block-minute has ranged between \$60 and \$75 in recent years.

Costs to Passengers: The value of passenger travel time typically is measured “as a proportion of the wage rate.”¹⁹¹

Measurement Metric: the average value of passenger travel time \$37.18 per hour (2008 value based on FAA recommended value for passenger travel time adjusted per Bureau of Labor Statistics (BLS) Employment Cost Index).¹⁹²

Costs of Emissions: As noted above, EPA evaluated emissions associated with increased taxiing times in this rulemaking. We have not been able to complete a thorough review of EPA’s methodology and, thus, cannot confirm whether EPA’s methodology is appropriate. For example, we note that EPA’s estimated additional emissions are based on assumptions about the additional “time-in-mode” taxiing to/from and idling at CDPs – while we agree additional emissions likely will result from this required activity, we have not thoroughly evaluated whether EPA’s “time-in-mode” assumptions are reasonable. It is clear, however, that EPA has not accounted for emissions associated with potential delays related to use of CDPs – a complete analysis would include such emissions. The following comments are made subject to that backdrop.

EPA’s analysis concludes that emissions of criteria pollutants is expected to increase at Tier One airports as a result of its Proposed Rule. EPA does not acknowledge, however, that these airports currently are all located in “Moderate” 8-Hour Ozone Nonattainment Areas (“NAA”).¹⁹³ In addition, BOS, EWR, IAD, JFK and LGA are in carbon monoxide (“CO”) Maintenance Areas.¹⁹⁴ As a result, if construction of CDPs require completion of a general conformity determination pursuant to Section 176(c)(4) of the Clean Air Act, these additional emissions may require mitigation.¹⁹⁵ This can be extremely costly – for example, nitrogen oxides (“NOx”) emission credits sold for over \$10,000 per ton in Southern California in December 2009.¹⁹⁶ In this context it is important to point out that EPA recently proposed to tighten the ground-level ozone standard.¹⁹⁷ In addition, it is worth noting that EPA’s projection

¹⁹¹ GRA, Incorporated (for FAA Office of Aviation Policy and Plans), *Economic Values for FAA Investment and Regulatory Decisions, A Guide* at 1-1 (Final Report, Revised July 3, 2007) (hereafter “GRA Economic Values”).

¹⁹² Available here: <http://www.bls.gov/web/eci.supp.toc.htm>

¹⁹³ See EPA’s listing of Ozone NAA here: <http://www.epa.gov/air/ozonepollution/designations/1997standards/statedesig.htm>.

¹⁹⁴ See EPA’s listing of CO Maintenance Areas here: <http://www.epa.gov/air/oaqps/greenbk/cmc.html>.

¹⁹⁵ EPA has proposed revisions to its General Conformity Regulations (*see* 73 Fed. Reg. 1402) (January 8, 2008)) and ATA has commented on that proposal (*see* EPA-HQ-OAR-2006-0669-0061.2) and hereby incorporates them here.

¹⁹⁶ See http://www.aqmd.gov/reclaim/docs/2010-1_avg_nox_price.pdf; NOx credits sold for as high as \$124,000 per ton during the California energy crisis in 2001 (*see* <http://www.aqmd.gov/hb/2003/030826a.html>).

¹⁹⁷ See <http://www.epa.gov/air/ozonepollution/actions.html#jan10s>.

that the “incremental” CO “emissions associated with aircraft deicing operations” at BOS and EWR are over the *de minimis* threshold of 100 tpy CO for maintenance areas, while JFK’s is just below the threshold at 94 tpy.¹⁹⁸

In addition to local criteria pollutants, EPA’s Proposed Rule will result in increased emissions of greenhouse gases (GHGs), including Carbon Dioxide (CO₂). Although EPA evaluates the increased CO₂ emissions associated with use of GRVs and AFBRs,¹⁹⁹ the Agency does not evaluate the CO₂ emissions associated with increased fuel burn required by increased taxiing and idling associated with use of CDPs. There are proposals now under consideration in Congress that would impose an “economy wide” scheme imposing economic measures to control GHG emissions that would cover transportation fuels, including jet fuel. While ATA opposes such legislation, should it be adopted the cost of any increased fuel consumption will not only include the cost of the fuel as fuel (which is already captured in the “Direct Operating Costs” metric discussed above) but the “carbon cost” of the fuel as well.²⁰⁰

Measurement Metrics:

- Criteria Pollutants: should be based on recent cost data from relevant markets.
- CO₂: if legislation is enacted that will impose a cost on CO₂ emissions, the cost should be evaluated based on reasonable estimates of CO₂ “permits” or “allowances;” EPA has used an estimate of \$15 per metric ton of CO₂ equivalent to evaluate legislative proposals in the recent past.²⁰¹

It must be noted as well that the emissions identified are in tons per year – thus, to the degree emissions from multiple years must be mitigated and/or “covered” by emissions permits or allowances, these costs are recurring annual costs, not one time costs.

Indirect Costs to the Economy: Airlines are an essential driver of economic activity. A very recent report from the FAA concludes that in 2007 “civil aviation activity within the overall economy was responsible for:”

¹⁹⁸ TDD at 12-7, Table 12-6.

¹⁹⁹ TDD at 12-3 to 12-4 & 12-8.

²⁰⁰ In the context of these Comments, we do not detail our position on any legislative or regulatory scheme designed to control GHG emissions through economic measures. Rather, the intent is to point out the need, in the event such a scheme is promulgated/enacted, to take costs that result from such a scheme into account. Major legislation approved by the House and Senate have covered jet fuel “upstream” by requiring jet fuel producers/importers to acquire allowances necessary to cover GHG content of fuel they introduce into commerce. In our view, the effect of such “upstream” coverage would be that 100% of that cost will be passed through to airlines, which have limited ability to pass through, in turn, the cost to passengers. See EA at 2-40 & 2-48 (“Thus, it appears that at least in the short run, it is difficult in today’s business climate for airlines to pass through a significant percentage of costs to their passengers”).

²⁰¹ EPA, *EPA Analysis of the Waxman-Markey Discussion Draft: The American Clean Energy and Security Act of 2009 – Executive Summary* (April 20, 2009) (available here: <http://www.epa.gov/climatechange/economics/pdfs/WaxmanMarkeyExecutiveSummary.pdf>).

- 12 million jobs
- \$1.3 trillion in total economic activity
- 5.6% of GDP²⁰²

Delays also impact airline customers in less direct ways, including increased shipping times, and lost productivity, wages and goodwill.

Measurement Metric: The JEC Report makes clear this also is a cost that is difficult to measure; however the JEC Report determined that “multiplying the delay costs to airlines by 1.5” is a reasonable means “to obtain an additional indirect impact due to delay.”

As pointed out at the beginning of this section, EPA must assess the cost of these impacts as they relate not only to the minimum increase in taxiing and idling times associated with the use of CDPs, but also as they relate to potential operational impacts. As pointed out in Section V (B)(5), above, although a very resource-intensive process, these impacts are routinely modeled for various airport projects; similarly, operational impacts (both during and after construction) associated with deployment of CDPs can be modeled and – using metrics as suggested above – the costs can be estimated. Again, evaluation of these costs is essential to promulgation of any viable Deicing ELG.

2. **EPA Fails to Include Costs Associated With Air Emissions From Other Sources**

In addition to the emissions associated with operational impacts (as discussed immediately above), EPA also must evaluate the costs associated with emissions from other sources. Potential metrics for evaluating these costs (whether the emissions at issue are criteria pollutants or GHGs) are discussed above – this section focuses on quantification of the emissions.

Emissions Associated With GRVs and Other Vehicles: EPA does quantify the GRV emissions it expects would result from the Proposed Rule. Again, we have not completed a detailed evaluation of EPA’s methodology and cannot confirm whether it is appropriate. The point here is that the economic cost associated with such emissions (through required mitigation or purchase of emission permits) must be quantified. In addition, EPA must expand its evaluation of emissions to include not only GRVs, but emissions from any other vehicles necessary to support deicing operations.

Emissions Associated With Support Facilities: EPA does not account for the need for other support facilities, including heated offices, lounges, and control towers/operation centers for deicing personnel, ADF storage areas, access roads, etc. Emissions associated with these facilities must also be quantified.

²⁰² FAA, Air Traffic Organization, *The Economic Impact of Civil Aviation on the U.S. Economy* at 7 (December 2009) (available here: http://www.faa.gov/air_traffic/publications/media/FAA_Economic_Impact_Rpt_2009.pdf).

Emissions Associated With AFBRs: EPA also evaluates emissions associated with operation of AFBRs, including “biogasses.”²⁰³ Again, we have not analyzed it in detail and we are not commenting on the general validity of EPA’s evaluation. We do note, however, that EPA states that there will be an “additional 17,300 tons per year of carbon dioxide from AFBR treatment,” of stormwater collected from CDPs, which results from flaring all the biogas generated by the treatment systems.

Emissions Associated With Construction: EPA also does not account for emissions that will result from construction of CDPs, AFBRs and associated facilities, including access roads, ADF storage facilities and stormwater storage facilities. Construction of treatment facilities (including associated pump and conveyance systems) at one medium hub airport alone, for example, was projected to result in estimated NOx emissions as high as 4.48 tpy.²⁰⁴

3. **EPA Fails to Identify and Account for Costs Associated With Devoting Land to Accommodate Selected BAT**

Perhaps as a result of its failure to assess properly whether land is available at airports to accommodate selected BAT, EPA does not attempt to ascertain the costs associated with acquiring and/or creating land necessary to accommodate such facilities.²⁰⁵ As EPA agrees, at land-constrained airports the costs of acquiring land necessary to accommodate required facilities (and/or for mitigating the associated environmental impacts) are likely prohibitive even for capacity enhancement projects.²⁰⁶ Thus, regardless of whether the land would be needed to accommodate collection, treatment and/or associated facilities at these airports, the costs will in fact be prohibitive.

Assuming that at some airports it is feasible to devote land to BAT and to do so at a reasonable cost, a component of that cost must be the opportunity cost associated with devoting the land to that purpose. In its *Economic Analysis*, EPA asserts:

In developing cost estimates for installing centralized deicing pads, EPA did not impute an opportunity cost for the use of airport land taken by the pads. EPA believes that the airports projected to install deicing pads to meet a 60 percent capture requirement for ADF will be able to install the pad(s) on their current property without purchasing additional land. Furthermore, deicing pads will

²⁰³ TDD at 12-8.

²⁰⁴ Port of Portland (CDM), Environmental Assessment for the Proposed Deicing System Enhancement Project at Portland International Airport at 5-6 (June 2009).

²⁰⁵ We recognize that EPA claims not to be mandating use of any specific BAT model technology. As noted elsewhere, we disagree with that contention. In the context of estimating the cost of compliance with the Proposed Rule, however, EPA is obliged to account for costs as though its model technologies were installed throughout the industry. It is in that context that we address the cost of land for BAT model technologies.

²⁰⁶ EA at 2-16. As noted above, EPA seems to suggest that environmental restrictions would in fact “prohibit” acquisition of land necessary to comply.

need to be installed within the existing structure of runways, aprons, and taxiways. Because of FAA-mandated restrictions on structure heights and clearances, EPA believes airports cannot use those sites for building terminals, cargo facilities, maintenance buildings or other structures. Thus these sites have few, if any, alternative uses that would create an opportunity cost for using the site to construct a deicing pad.²⁰⁷

This logic is flawed. EPA itself provides examples within this passage of uses to which land that, if not devoted to CDPs, could be put, namely runways, aprons and taxiways. In other words, there is an opportunity cost of devoting land to CDPs, *i.e.*, the possibility of devoting it to runways, aprons and taxiways. Thus, land devoted to CDPs (or any other related facility) necessarily comes at the cost of devoting the land to projects that could improve airport capacity. As a result, the opportunity cost is the foregone economic benefit that could be derived from devoting land to uses that increase capacity and/or improve the efficiency or safety of the airfield.

CDPs are not the only facilities that would be required to meet EPA's proposed BAT standards. Clearly, large wastewater storage and treatment facilities would be required as well. EPA recognizes such structures are subject to "FAA-mandated restrictions on structure heights and clearances," and other safety considerations (including bird strike hazards). Thus, to the degree devoting land to these uses displaces or precludes potential "airside" projects that could enhance capacity and/or improve efficiency there is a measurable opportunity cost; to the degree such structures could displace landside facilities such as "terminals, cargo facilities, maintenance buildings or other structures," there also is a measurable opportunity cost.

4. EPA Fails to Account for Minimum "Costs of Entry" and Imperfect Scalability Associated With Selected BAT Model Technologies

EPA assumes that the BAT model technologies it has selected are perfectly scalable – that is, that any airport can size CDPs, GRVs, AFBRs precisely according to its needs. The "perfect scalability" is implicit in, and results from, the linear equations the Agency uses to estimate costs at airports. Obviously, it is not possible to acquire and maintain just one-half a GRV, or 3.4 GRVs. So, too, there is a minimum size below which it is impossible to construct an AFBR or an economically viable CDP. Thus, costs of deploying the model technologies on which EPA based its BAT do not progress linearly, but rather in "stair steps."

a. GRVs Cannot Be Deployed in Perfectly Scalable Units and EPA Must Account for "Costs of Entry"

Unlike other metrics EPA uses to estimate costs, which are per-departure metrics, the metrics to estimate capital and O&M costs are based on a particular feature of airport infrastructure – the number of stormwater outfalls associated with deicing activities. We explain the inadequacy of this approach below. Here we focus on the ways in which application of these metrics will lead to underestimation of costs.

²⁰⁷ EA at 4-3.

EPA reports that it uses a value of \$108,000 for its “GRV Normalized Capital Cost.”²⁰⁸ This is a fraction of the cost of a single GRV: EPA reports using a value of \$360,000 per GRV in estimating “Block-and-Pump” systems citing Document - 0833,²⁰⁹ which *in 1999\$* reported a range of costs of \$200,000 to \$400,000 and cost of a specific GRV of \$400,000.²¹⁰ Assuming the cost of each GRV Unit used by EPA to calculate costs then is about one-third the price of a single truck, because many airports are assumed to need a number of GRV Units that is not a multiple of three they will in fact incur higher costs than projected by the metric. That is the “cost of entry” to GRVs is (at least) \$400,000 per vehicle which is not reflected by the metric.

The underestimation is compounded where, as is inevitably the case, deicing operations at an airport are not separated neatly into fractional shares equivalent to the number of outfalls. Where wholly separable operations are taking place at locations very far apart from one another (*e.g.*, passenger airlines often have separate operations dedicated to their fleets; cargo operations often are separated from passenger operations as well), one GRV unit per outfall will not provide adequate coverage. Even assuming EPA’s estimate that one GRV unit will be needed for each outfall is correct (which it is not), an airport with two outfalls that serve simultaneous aircraft operations and are too distant to be served by a single GRV will need two GRVs costing at least \$800,000 (again, in 1999\$), not the predicted \$216,000 cost of 2 GRV units (which really represent about 2/3 of a full GRV).

b. AFBRs Cannot Be Deployed in Perfectly Scalable Units and EPA Must Account for “Costs of Entry”

In addition, EPA assumes it is possible to economically construct and operate very small AFBR systems – the reality is that “the cost of entry” for AFBRs is quite high. The equation EPA uses to estimate AFBR costs assumes a capital cost of \$1,659 for each pound of COD treated per day over an airport specific deicing season (a value it did use when estimating costs for Tier Two airports). As a result, the cost of an AFBR system decreases linearly with lower daily COD loading to a cost of \$1,659 for a system capable of treating one pound of COD per day. This assumption is incorrect, does not consider the ‘cost of entry’ associated with this technology and fails to recognize cost inefficiencies associated with the construction of smaller treatment facilities.

Cost data for implementation of AFBR technology was derived from information provided by ALB and CAK airports. These two facilities treat 5,200 lbs. and 3,400 lbs. of COD

²⁰⁸ TDD at 11-15. We note that EPA does not use this value to calculate GRV Capital Costs; the costs reported in its Cost Annualization Model were calculated using a \$123,165 value. *See Document - 0634*, Column EL (“GRV Collection Capital Cost (2006\$)”) – all of these values are the product of \$123,165 and the number of “deice” outfalls reported by each airport. The \$123,165 value is the value ERG reported using to calculate the GRV Capital Costs. Document - 1100, at 7-8 values. A parallel mistake is made in calculating GRV O&M costs: EPA says it used \$7,300 as reported in the TDD (at 11-15), but the value used to calculate costs for airports was \$8,404, the value ERG reports using in Document - 1100.

²⁰⁹ Document - 0844 at 2; the cite is to “Workshop: Best Management Practices for Airport Deicing Stormwater,” which is included in the Record as Document - 0833.

²¹⁰ Document - 0833 at 21.

per day, respectively using AFBR treatment. Capital costs for both facilities were normalized to the pounds of COD treated per day to arrive at an average cost of \$1,659 per pound of COD treated per day. Similarly, operations and maintenance costs were normalized to pounds of COD treated. Smaller systems will be more expensive on a per pound of COD treated basis compared to larger facilities because both facilities require support systems which are not directly associated with the treatment of COD. Specifically, support systems such as gas handling systems, explosion proof equipment, nutrient dosing systems, caustic dosing systems and stainless steel construction (or coated steel) are required no matter what size of a system is constructed.

EPA's approach also fails to recognize that there are fixed costs associated with the purchase and construction of these systems. For example, a linear regression analysis of the two airports (CAK and ALB) for which cost data are available results in the equation:

$$\text{AFBR Capital Cost} = 2,000,000 + 1172.2 * \text{COD Loading}$$

This equation indicates that the "cost of entry" to the construction of an AFBR system comparable to those constructed at CAK and ALB is \$2,000,000 and further indicates that the costs associated with airports such as BET, BHM and OTZ are significant underestimates of actual construction cost.

EPA did recognize that at some point alternatives other than the selected BAT may make more economic sense. For example, the Agency assumed some airports that use very low amounts of ADF would choose to ship collected runoff offsite for treatment rather than incur the cost of AFBRs. Where there is no other economic alternative (or alternative that would achieve applicable BAT) EPA must estimate costs based on the level of expense necessary to acquire/construct and operate the "entry unit" – i.e., one GRV, one CDP, etc. – necessary to achieve the applicable BAT standard.

5. **EPA Fails to Include Costs to Be Incurred at Airports Deemed to Be "Zero Cost"**

EPA assumes certain airports will incur no costs. The basis of the assumption is three-fold -- EPA's estimate of: (1) ADF collection efficiency; (2) ADF usage; and/or (3) levels of jet departures. Each of these categories is addressed in turn below.

Airports that are assumed to be "zero cost" airports, but will and/or are incurring costs necessary to achieve compliance with proposed BAT. EPA attributed collection efficiencies to airports on the basis of responses to questionnaires. Regardless of whether its actual collection efficiency meets the required 60% collection efficiency, if an airport reported the existence of a "deicing pad" at its facility, EPA attributed a 60% collection efficiency to that airport. This leads to a gross underestimation of costs.

SLC provides perhaps the most telling example. Although EPA asserts the airport currently is able to meet the 60% collection efficiency, SLC has only recently begun a program to construct six deicing pads. So far SLC has approved the construction of 3 of these pads at an estimated cost of \$201,000,000. Thus, EPA's methodology for assessing current collection efficiencies at airports and, on that basis, attributing costs to airports has led to miss at least \$201million in costs at just one airport, SLC.

It appears from data available from MSP that current collection practices at that airport may not achieve collection of 60% of applied ADF, although MSP has spent about \$80 million in deploying CDPs.

Airports that are assumed to be “zero cost” airports because EPA erroneously concludes they are below the 460,000 gallons ADF usage threshold. Similarly, based on erroneous estimates of ADF usage at certain airports, EPA concludes that they already meet collection standards that would be imposed under the ELG. The most important example of this is ANC. According to EPA, ANC falls below the 460,000 ADF gallons-per-year usage threshold and thus is required to collect 20% rather than 60% of available ADF sprayed. ATA analysis of publicly available information indicates that both of these airports currently exceed this threshold and therefore would be required to meet the 60% collection standard.

It also is important to emphasize that given the length of time it requires to plan, finance and actually construct major infrastructure at airports, even if they currently were below the proposed ADF usage threshold, airports just below any threshold likely would be compelled to plan to comply with the more stringent standard. This is because – despite the recent spate of international events and downturn in the economy that have depressed aviation growth in recent years – the long-term prediction for the industry is for growth. With growth – given the current state of deicing technology available – airports will assume that more traffic will mean more deicing fluid use. Airports on the cusp of threshold between a 20% collection requirement and a 60% collection requirement will plan accordingly. In short – the usage threshold (indeed any usage threshold) will effectively encompass more airports than putatively encompassed at the time of promulgation. IND – which EPA estimates uses 452,000 gallons ADF annually, just below the 460,000 threshold, is an example of such an airport.

It is worth noting in this context that EPA asserts that it established the 460,000 gallon threshold precisely because requiring these airports to meet the 60% collection standard would “incur a heavy economic burden.”²¹¹ Indeed, EPA itself concludes IND would incur costs amounting to over 8% and ANC over 5% of their operating revenues, far above the 3% threshold it established for evaluating economic achievability.²¹² Thus, the proposed threshold does encompass two airports EPA agrees cannot reasonably afford to be subject to the associated requirements. Any such threshold will need to be much lower than projected usage to ensure these airports are not subject the proposed ADF Collection BAT for Tier One Airports.

Airports that are assumed to be “zero cost” airports because EPA erroneously concludes they will remain below the proposed jet and total departure thresholds. Just because some airports currently are below the thresholds for applicability of BAT, does not mean they will remain there. Again, it is universally anticipated that aviation will grow in the long run – as a result, more airports will cross these thresholds. While it is possible some may drop below the

²¹¹ EA at 5-26.

²¹² EPA’s analysis concluded that the costs of compliance with a “60 Percent Collection / Control Scenario” would amount to 8.08% of operating revenues at IND and 5.15% at ANC. Document – 1099, Table 6 at 28. As discussed in Section XI (E)(1), below, this threshold is not a reasonable measure of economic achievability – the point here is that using its own economic benchmark EPA must conclude the Proposed Rule is unreasonable as to these airports.

thresholds, in the universally assumed long term scenario of continued expansion of the economy and with it aviation, the net effect will be for more rather than fewer airports to become subject to the proposed standards. Again, airports that are approaching a threshold most likely will plan as if they already are subject to requirements because they are projected to exceed the thresholds. In fact, when planning the construction of deicing pads, the FAA expressly “recommends an evaluation of aircraft development for a planning period of at least 10 years.”²¹³ Concomitantly, the Agency must also assume the real world effect of its regulation will be to impose costs on airports that currently are below the departure thresholds.

6. EPA Fails to Account for Costs Associated with Selected BAT for Pavement Deicing

EPA designates substitution of urea with alternative pavement deicers as BAT for pavement deicing at airports. ATA has not undertaken a detailed evaluation of the methodology EPA used to estimate the costs of substituting urea with other alternative pavement deicers and we do not endorse that methodology here.

However, from our limited review of EPA’s cost analysis we observe that it is inadequate in several respects:

- EPA does not account for certain cost elements, including:
 - Costs associated with shipping alternative products to certain airports;
 - Special handling needs associated with alternative products; and
 - Supply issues – shortages of pavement deicers may be more likely to emerge during severe events (*e.g.*, the recent winter storms on the East Coast) where fewer approved alternatives are available.
- There appear to be side effects associated with using alternative deicers, including corrosion of aircraft electrical components and carbon brakes, and deterioration of airfield equipment and pavement.²¹⁴ These side effects bring large potential associated costs, including:
 - Increased aircraft inspection and maintenance programs;
 - More frequent replacement of aircraft components (electrical components, carbon brakes); and
 - More frequent replacement of aircraft components and/or airfield equipment and infrastructure.

7. Other Costs

This discussion overlaps somewhat with the discussion of the errors made in deriving its cost metrics (inconsistency with asserted methodology; *see* Section VI(A)(2) above) and the inadequacy of EPA’s cost metrics (*see* Section VI(C), below). Here, the point is that EPA’s cost

²¹³ Document - 0740 at 4.

²¹⁴ See generally, ACRP, *Synthesis Report – 6, Impact of Airport Pavement Deicing Products on Aircraft and Airfield Infrastructure* (2008).

estimates do not take into account certain cost elements, including cost elements unique to certain airports for which its cost metrics cannot (and so, do not) account. The list below provides some examples of such costs and is not meant to be exhaustive:

- Certain airports may face unique costs related to particular issues posed by existing infrastructure. For example, SLC will need to relocate a cargo facility to accommodate its plans to construct deicing pads – this will cost over \$42,000,000.²¹⁵
- “Topography is a **key cost factor** in constructing a deicing facility.”²¹⁶ EPA ignores this factor. The airports EPA uses to derive its CDP Capital Cost metric for pads are CAK, PIT and MSP – clearly geological and water table conditions at these airports are very different from many of the airports that stand to be most impacted by the rule, many of which are built on coasts, including LGA, EWR, JFK, and BOS.
- EPA ignores the use of other supplemental techniques and activities used to achieve collection efficiencies at certain airports. For example, as noted above, the Agency uses MSP as one of the airports to derive its metric for estimating pad costs, but notes in its own site visit report only 70% of deicing at MSP takes place at deicing pads. Thus, EPA has effectively excluded costs associated with these activities from its consideration.
- EPA ignores costs associated with glycol recovery operations that rely primarily on deployment of GRVs. In May 2009, the Metropolitan Washington Airports Authority (“MWAA”) issued an RFP for provision of glycol collection and management services at IAD and DCA. In its Statement of Work setting out the requirements for the contract, MWAA specified that in addition to GRVs, contractors must provide:
 - Supervisor trucks and supervisors
 - Vacuum trucks and operators
 - Inflatable drain plugs
 - Mechanical drain inserts

MWAA provides office space to its contractor, which is another cost that must be taken into account.²¹⁷

- As noted below in Section V (C)(3)(c), not all airports EPA uses to derive its cost metrics for deicing pads include planning and design costs. The Agency effectively accounts for this category of costs in part only.

²¹⁵ Source: 10/16/09 e-mail from Kevin Robbins, SLC Director of Engineering and attached slides (Attachment 1)

²¹⁶ Document - 0741 at 6 (emphasis added).

²¹⁷ See STATEMENT OF WORK FOR AIRCRAFT DEICING FLUID RECOVERY, DISPOSAL, AND RECYCLING MANAGEMENT SERVICES FOR WASHINGTON DULLES INTERNATIONAL AIRPORT AND RONALD REAGAN WASHINGTON NATIONAL AIRPORT (May 2009).

- EPA also does not take into account costs associated with construction, operation and/or maintenance of facilities necessary to support deicing facilities, particularly facilities designed to accommodate operations at our nation's largest airports; examples include:
 - Access and bypass taxiways for aircraft;
 - Access roads to/from deicing areas for ground vehicles;
 - Operations facilities:
 - Control center/tower (including operations control room and administrative offices);
 - Employee facilities for truck operators and supervisory staff, including locker room, bathrooms, break room, and parking;
 - Snow storage and management space (for snow removed from CDPs);
 - Glycol storage, premixing and pre-heating, unloading and loading, facilities;
 - Fuel tanks and fueling stations for vehicles, including deicing trucks, GRVs, and support vehicles;
 - Vehicle/equipment storage and parking;
 - Vehicle/equipment maintenance facility;
 - Diversion structures (to allow diversion of high and low-strength stormwater flows);
 - Pump stations;
 - Employee training;
- Environmental review and analysis (including preparation of Environmental Impact Statements pursuant to the National Environmental Policy Act and Conformity Determinations pursuant to the Clean Air Act, where these requirements are triggered); analyses/modeling of operational impacts. (Again, it is especially important to remember that airlines incur such costs completely independent of airports.)

C. The Agency's Cost Metrics Are Arbitrary

1. Metrics for CDP Capital, CDP O&M and Tank Costs Are Arbitrary insofar as They Are Based on Annual Departures

Both EPA's metrics for estimating capital costs and O&M costs for CDPs are per-annual departure metrics. Adopting a "cost per-annual departure" metric for estimating costs is arbitrary in that:

- Departures at airports fluctuate with market forces. Presently, for example, departures are far below both recent levels and levels that had been expected. If

derived today, because the annual-departure denominator is much lower, the metrics would thus be higher and, in turn, the projected costs would be higher.

- Pads are sized within design constraints to accommodate peak-hour departures, not annual departures generally.
- Annual departures are not relevant to costing infrastructure designed to serve a much smaller subset of operations, *i.e.*, departures in winter conditions requiring deicing.
- EPA’s own analysis indicates that the supposed “relationship” between total annual departures and deicing pad costs does not exist. As described in more detail below, in deriving the Pad Capital Cost metric the Agency threw out CLE data without explanation, but included data from CAK. Thus, to derive this cost metric, EPA relied on data from an airport it decided not to cover under the Proposed Rule and exclude data from an airport it decided to include in the proposed rule.

Indeed, the data from MSP, one of the airports relied upon by EPA to derive the CDP Capital Cost metric, illustrates that the metric for that airport depends on the time at which the sample is taken. Using the cost data relied upon by EPA,²¹⁸ inflation data from the Bureau of Labor Statistics²¹⁹ to adjust costs, and operations data from MSP,²²⁰ yields the following:

Year	Pad Cost*	Pad Cost (2006\$)	Cumulative Cost (2006\$)	Departures**	Cost (2006\$)/ Departure
1998	10,586,344	13,093,294	13,093,294	129,910	\$100.79
1999	4,257,540	5,151,981	18,245,275	143,410	\$127.22
2002	22,723,079	25,463,995	43,709,270	141,196	\$309.56
2004	16,692,561	17,814,824	61,524,095	164,062	\$375.01
2005	15,438,212	15,936,219	77,460,314	161,363	\$480.04

* Cost in year specified, expressed in dollars of year specified.

** CDPs at MSP serve only 70% of departures – levels adjusted accordingly

By comparison, the value used by EPA to estimate CDP Capital costs is \$314.56 / annual departure.²²¹ EPA’s methodology introduces even more randomness into the calculation given that the relative effect of economic or other factors on departure levels is not uniform across airports. Departures at MSP have declined in recent years, but not nearly as much as they have at PIT or CAK. The arbitrariness of using annual departure, particularly just one year’s worth of data, is reflected in the radically different result EPA would get if it derived its CDP Capital Cost metric based on more recent data:

²¹⁸ Document - 0812.

²¹⁹ U.S. Bureau of Labor Statistics, available here: <http://ftp.bls.gov/pub/special.requests/cpi/cpi.txt>.

²²⁰ ATA Economics department, pulled from BTS T-100 Database per EPA’s instructions.

²²¹ TDD at 11-23; Document - 0845.

Airport	Annual Departures (2008)	Total Pad Costs	Per Departure Cost
MSP	206,092	\$79,300,000	\$385
CAK	11,817	\$5,100,000	\$432
PIT	68,643	\$35,000,000	\$510
			\$442

Another example that illustrates the magnitude to which EPA's per-annual departure cost metric distorts reality comes from SLC. As noted above, that airport is just beginning to begin the process of implementing a program to construct the first three (of six planned) deicing pads. The cost of these pads will come to about \$201,000,000. On per departure basis (using the 142,143 annual departures attributed to SLC in its cost model, Document - 0631), that amounts to \$1,414 per departure, or about 450% higher than EPA's \$314.56/departure cost.

Similar results apply to other per-departure level metrics EPA used to estimate costs. For example, the tank costs were calculated using the following formula:

$$\text{Cost} = \frac{\text{number of annual departures} * \text{average of the storage tank volume per departure} * \text{average of storage tank capital costs per gallon}^{222}}{\text{average of storage tank capital costs per gallon}^{222}}$$

We discuss other aspects of this calculation below. Here we focus on the second component: EPA derived an average of the storage tank volume per departure of 24 using data from three airports: PDX, PIT, and CVG. As shown in the chart below, using departure levels from 2008, EPA would derive a average storage tank volume per departure of 39 – as a result, its tank cost estimates would be 63% higher.

Airport	Storage Tank Volume	Annual Departures (-0853)	Tank Volume per Annual Departures	Annual Departures (2008)	Tank Volume per Annual Departures
PDX	2,000,000	206,092	21	100,344	20
CVG	8,000,000	11,817	32	134,470	59
PIT	2,500,050	68,643	20	68,643	36
			24		39

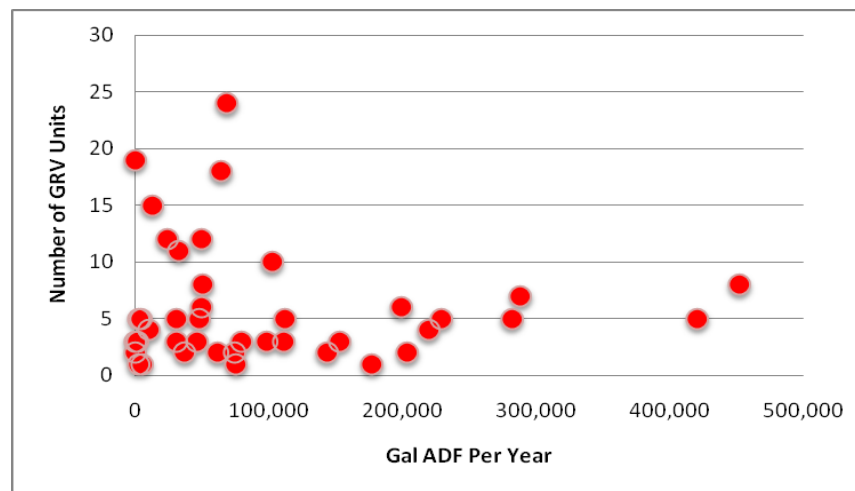
2. The Metrics Are Arbitrary in that They Assume Perfect Scalability and Uniform Applicability Across Airports

We have discussed the concept of scalability in other contexts. The point is reiterated here to emphasize the arbitrary results resulting from the use of arbitrary metrics. These arbitrary results – the assignment of costs that correspond to deployment of portions of CDPs,

²²² TDD at 11-28, Document - 0853.

GRVs, AFBRs and other technologies, and are perfectly scalable to the very largest and the very smallest airports – can only be removed by removing the arbitrary metrics that generate them.

It also is important to add that the results imply uniformity across the landscape, generating very strange results. For example, SAT is assumed to need 15 GRV units to deal with an annual ADF usage of 12,745 gallons per year, while MHT is projected to need just one GRV unit to deal with 177,307 gallons of ADF per year; CLT is projected to need 2 GRV units to deal with 143,572 gallons ADF, while GSO is projected to need 12 times more GRV units to deal with less than one half the ADF (24 GRV units; 68,716 gallons ADF). The following graph, for example, illustrates the nearly complete lack of correlation between the number of deicing outfalls and the amount of ADF to be collected at Tier Two airports:



Correlation Coefficient = -0.06

Similar anomalies exist with respect to the Agency's storage tank metric:

Storage Tank Metric (per departure)

- The single largest purchase of storage tanks is projected to be made by CLT, an airport projected to need just two GRVs to collect stormwater; every Tier One airport is projected to need *less* storage space to store runoff from CDPs collecting far more fluid and stormwater.²²³
- Using the metric for tank costs, airports like LAS and PHX – located in warm, arid climates where very little ADF is needed and there is little precipitation – are projected to need the second and fourth largest amounts of tank storage.

²²³ EPA's use of a 0.33 "scaling factor" for Tier One tank costs is discussed below; even if this factor was not used, CLT is still projected to need more storage tanks than any other Tier One airport projected to incur costs under the regulation except ORD and EWR.

While EPA (rightly) recognized PHX is an airport that should not be projected to need stormwater management measures (LAS is not addressed),²²⁴ there are no “fixes” provided to correct the metric-driven distortions across other airports. For example, the “COD Load-Normalized Cost” metrics used to derive AFBR capital and O&M costs each include the number of days a system is operated in the denominator. As a result, the longer a system must be operated, the lower the assumed O&M costs – a result that just does not correspond to reality. Thus, two systems ***handling exactly the same COD load annually*** will have vastly different costs depending on the length of the season. Take hypothetical Airport A, with a deicing season of 240 days (similar to Alaska) and Airport B with a deicing season of 120 days (similar to a temperate climate); if both handle 1 million/lbs. COD annually, Airport A will be assumed to incur O&M costs of \$0.93 million, while Airport B – ***though it operates half as long*** – will be assumed to incur ***twice*** the cost, \$1.86 million. This effect is reflected in EPA’s analysis: while ROC and DCA are estimated to use roughly equivalent amounts of ADF, the O&M cost of DCA’s AFBR system is estimated to be \$413,228, more than double the \$195,542 O&M cost of ROC’s system, though DCA’s system would operate over a much shorter period; the same is true of GRR and RDU: GRR is estimated to use 98,156 gallons ADF annually and RDU 102,145, but EPA estimates RDU’s cost of operating and maintaining its AFBR for 120 days each year will be \$196,657, while GRR is projected to spend just \$109,863 to operate its system for 210 days.

3. The Metric for CDP Capital Costs Is Arbitrary

a. EPA’s CDP Capital Cost Metric is a Per-Departure Metric, But CDP Costs Are NOT Determined by Annual Departure Levels

The Record establishes that the cost of CDPs is not closely related to departure levels (either annually or during deicing season). The FAA clearly advises that the total capacity of deicing facilities is determined with respect to the airports’ peak hour capacity during deicing conditions.²²⁵ In fact, EPA seems to be drawing on this in requiring that “[d]eicing facilities shall be sized to accommodate the airport’s peak hourly departure rate” as one of the technical specifications that must be met to be deemed in compliance with the 60% collection requirement.²²⁶ Yet, data show that annual departure levels and peak hour levels at the airports EPA used to derive its cost metric are not related:

Airport	Annual Departures	Peak Hour Departure	Ratio (Deps/Peak)
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²²⁴ See Document - 0851.

²²⁵ Document - 0741 at 4 (“Airports should have deicing facilities with a deicing/anti-icing capacity that approximates the airport’s peak hour departure rate that the ATCT can manage during icing conditions. This departure rate helps determine the number of aircraft deicing pads required at a facility or facilities to balance the departure rate and the holdover times of applied deicing/anti-icing fluids so that, to the extent practicable, holdover times are in effect when the pilot receives takeoff clearance.”)

²²⁶ Proposed § 449.20(b)(ii)(D).

	(2008)	Rate (12/08)	Hour)
MSP	206,092	50	4,122
CAK	11,817	5	2,363
PIT	68,643	18	3,814

FAA also advises the number of pads required is generally a function of a number of variables, including “variations in meteorological conditions” and “type of aircraft receiving treatment,” but not annual departure levels.²²⁷

b. The Metric for CDP Capital Costs Is Based on Arbitrarily-Selected Cost Data

In the TDD, EPA explains that, based on data from three airports (unidentified in the TDD), EPA derived a “normalized” CDP Capital Cost of \$314.56 per departure, but in its supporting memorandum (Document - 0845), EPA used four airports (CAK, PIT, MSP and CLE) to derive the normalized figure. Using the four airports, EPA there concluded the CDP Capital Cost per departure is \$366.50.

EPA does not explain its decision to exclude CLE costs from its calculation of the metric for estimating CDP Capital Costs, but it is striking that it chose to ignore the data indicating the highest value. More to the point is that EPA decided to retain the data from CAK, even though EPA ultimately determined to “descope” that airport, that is, exclude it from coverage. Thus, in deriving its cost metric for CDP Capital Costs, EPA has decided to include information from an airport it has excluded from coverage the rule, but to exclude information from an airport it has decided to include in the rule. In other words, data from an airport not covered by the rule is deemed relevant to deriving costs for airports subject to the rule, while data from an airport that is covered under the rule is deemed irrelevant. EPA does not explain why an airport that is not covered by the rule is a better indicator of costs than an airport that is covered by the rule. Still more curiously, EPA uses a per-departure storage volume metric as a component of the formula used to calculate tank costs and explains that in deriving that metric is it did not include DIA and CAK in the “gallons-per-departure” because they “appeared to be outliers.”²²⁸

Indeed, the contrast between the inclusion of CAK data and the exclusion of CLE data becomes even more stark when the Record is closely examined. The CAK data that EPA relied upon can be found in Document - 0804, an email from CAK to EPA’s consultant Eastern Research Group (“ERG”) dated May 3, 2007.²²⁹ That email reads (emphasis added):

²²⁷ Document - 0741 at 4.

²²⁸ Document - 0853 at 2. We note that EPA lists the “total storage tank volume” for DIA as 420,000; yet its own Engineering Site Visit Report for the airport (Document - 0513) reports that DIA has five 420,000 storage tanks at its recycling plant (page 5), for a total of 2,100,000 gallons of tank storage capacity. Of course, this pales in comparison to the 61,600,000 gallon capacity of the airport’s six ponds (page 6).

²²⁹ That this is the source of EPA’s information for CAK cannot be doubted. The attachment to this email lists the costs of the “North Deicing Pad” and “South Deicing Pad” as \$1.8 and \$3.3 million, respectively, for a total of \$5.1 million. EPA explains in Document - 0845 at 1: “According to information provided by email from Akron-Canton, the installed capital cost for their North and South deicing pads is \$5.1 million.” This \$5.1 million figure is the one used in the calculation of the CDP Capital Cost metric in Document -0845 and retained for the calculation in the

Attached please find the cost breakout you requested. Keep in mind *that some of these numbers are estimates*, especially on the operating cost side. We don't anticipate plant start up until June. If you need further information feel free to contact me.

In contrast to the "estimates" provided by CAK, CLE confirmed the costs of its CDPs in a telephone conversation with EPA officials.²³⁰ Moreover, EPA *relied on the very same information it had rejected for purposes of deriving the CDP Capital Cost metric when attempting to ascertain the relationship between CDP costs and runway costs.*²³¹ There simply is no rational explanation as to why EPA would reject the CLE data it had used in other analyses and confirmed with CLE officials, yet retain information from CAK that CAK officials had warned was only an estimate. There certainly is no explanation in the Record.

c. **The Metric for CDP Capital Costs Is Based on Inconsistent and Incomplete Cost Data**

The data from the three airports upon which EPA relies (CAK, PIT and MSP) to derive its CDP Capital Cost metric is incomplete and inconsistent.

As noted above, the data from CAK largely consists of "estimates."

The data from PIT also is incomplete and does not reflect costs in 2006 dollars. EPA reports that the "[t]otal installed costs for Pittsburgh's three deicing pads is \$35 million"²³² EPA cites its *USEPA Engineering Site Visit Report for Pittsburgh International Airport (August 2006)* as the source of the \$35 million figure for PIT. The final version of this report, dated November 2006, is Document - 0509. In that report EPA notes that:

At PIT, aircraft deicing/anti-icing is performed on dedicated deicing pads. . . . PIT has five deicing pads for commercial and air cargo aircraft deicing.²³³

These pads are already active and described as such in this document. EPA also reports:

During the site visit, airport personnel provided the following estimates of costs associated with their deicing/anti-icing operations:

- Design and installation of the deicing pads C and E:
\$10,000,000
- . . .
- Design and installation of the deicing pad S: \$25,000,000²³⁴

TDD (at 11-17). The TDD lists "Airport 1" as having 14,911 annual departures and \$5.1 million "total installed cost for all deicing pads," the same figures attributed to CAK in Document - 0845, Table 1.

²³⁰ Document - 0820.

²³¹ Document - 0831, Table 1.

²³² Document - 0845 at 1-2 (footnotes omitted).

²³³ Document - 0509 at 4.

EPA apparently concluded that these costs are 2006\$ because they are reported in a document dated 2006. However, the report also makes clear “EPA . . . conducted [the] site visit . . . on February 10, 2005.”²³⁵ Thus, it was impossible for PIT officials to report costs in 2006\$ because the visit was conducted in 2005. Moreover, EPA’s consultant communicated directly with PIT regarding costs of its deicing pads and, in an email dated December 6, 2007 (Document - 0813), PIT clearly identified costs associated with Pad S to be in 2001\$. An accompanying document detailing costs (Document - 0817), placed the total value of the contract at \$22.1 million; the email stated that this did not include either Design Costs or Construction Management Costs, both of which were estimated to be about \$3.3 million (“@ 15%”). Thus, the total costs for “Pad S” as reported to EPA in response to its specific requests, was at least \$26.6 million in 2001\$. EPA arbitrarily ignores this information when deriving its cost metric for CDP Capital Costs.

In addition, EPA does not include the costs associated with the other two deicing pads in operation at PIT. These are the “FedEx/Cargo” facility and the “FBO” facility. According to the *2006-2007 Deicing Action Plan Update – Pittsburgh International Airport* prepared by CDM²³⁶ these sites accounted for the following percentages of the PG collected at PIT during the four deicing seasons analyzed as follows:

PG Collected at PIT

	'03-'04	'04-'05	'05-'06	'06-'07
	Total (PG from All Collection)			
PG Collected	428,805	208,630	150,932	211,066
	FedEx/Cargo Pad			
PG Collected	4,169	10,005	10,937	11,937
Percent of Total	1.0	4.8	7.2	5.7
	FBO Pad			
PG Collected	44,766	28,761	19,439	31,046
Percent of Total	10.4	13.8	12.9	14.7
	FBO + FedEx			
PG Collected	11.4	18.6	20.1	20.4

At a minimum, the FBO and FedEx/Cargo pads excluded from the analysis – which together typically account for about 20% of the deicing fluid collected – need to be taken into account in assessing costs at PIT. From another perspective, the three pads EPA does take into account when estimating costs at PIT account for approximately 65% of the collection of PG collected. (See chart below). Concluding that 100% of the cost of installing pads at PIT is attributable to three pads that together account for just 65% of the fluid collected at the airport is clearly incorrect. In addition, the CDM report indicates both that three other pads play a role in ADF

²³⁴ Document - 0509 at 9.

²³⁵ Document - 0509 at 1.

²³⁶ EPA apparently intends to refer to this document in the TDD at 9-4; at page 9-5 it lists “CDM. 2006. *2006 Deicing Action Plan Update – Pittsburgh International Airport* (Excerpts)” as the referenced document.

collection at the airport (“Yankee North,” “Yankee South,” and “N-South), as do GRVs and a culvert associated with Pad C.

PG Collected at PIT

	'03-'04	'04-'05	'05-'06	'06-'07
	Total (PG from All Collection)			
PG Collected	428,805	208,630	150,932	211,066
	Pad C			
PG Collected	91,214	59,954	38,517	96,316
Percent of Total	21.3	28.7	25.5	45.6
	Pad E			
PG Collected	185,627	39,976	20,815	32,071
Percent of Total	43.3	19.2	13.8	15.2
	Pad S			
PG Collected	37,252	18,849	37,875	9,439
Percent of Total	8.9	9.0	25.1	4.5
	Pad C + Pad E + Pad S			
Percent of Total	73.5	56.9	64.4	65.3

With respect to MSP as noted above, the MSP data – as used by EPA – is not an appropriate basis for establishing the cost of deicing pads. EPA derives the per-annual departure metric relying, in part, on data from MSP. If one were to accept the “per-annual departure” metric, the MSP data needs to be adjusted to reflect that pads serve just 70% of operations at MSP.

In addition, the data from these airports is not consistent as to what is included and what is not. While the PIT data did not include construction management or design costs, the MSP data did,²³⁷ while the CAK data apparently only included raw capital costs.²³⁸

d. The Metric for CDP Capital Costs Is Arbitrary Because It Does Not (and Cannot) Reflect Airport-Specific Design Elements

It is impossible to estimate reasonably the cost of a CDP at a particular airport without detailed site specific information. As illustrated above, the cost of a CDP cannot be reliably related to aircraft departures. Just as importantly, the peak hourly departure rate and fleet mix are critical design parameters in the design – and so, the costs – of CDPs. For example, at PIT the cost associated with the construction of pads C and E which have the capability of deicing 6 aircraft at a time is \$10,000,000. In contrast, the cost associated with Pad S is \$25,000,000 which has the capability of deicing 3 aircraft at a time. The difference is attributed, in part, to the

²³⁷ See Document - 0012, specifying “Engineering Services” and “Administrative Costs,” as line items.

²³⁸ See Document - 0804.

size of the aircraft. Specifically, Pad S is sized to accommodate 3 wide-body aircraft. Clearly it is not a “different” annual departure level at PIT that determines the cost of these pads.

The cost of deicing pad construction is also a function of existing infrastructure. Analysis of pad construction costs at MSP indicates that deicing pad construction costs range from \$7 per square foot up to \$58 per square foot. Similarly, the cost of a pad at CLE was approximately \$130 per square foot compared to approximately \$22 per square foot for Pad E at PIT.

EPA’s simplification of the method to estimate cost for a CDP by relating cost to the number of annual departures fails to recognize critical factors in the design of safe and operationally acceptable deicing pads at specific locations to meet specific objectives. This failure results in the significant underestimation of construction costs due to differences in fleet mix and site-specific construction issues.

4. The Metric for CDP O&M Costs Is Arbitrary

EPA derives its metric for CDP O&M costs from information supplied by a single airport, MKE. From that information it determined that CDP O&M costs are equal to \$8.87/departure. However, EPA had previously derived precisely the same metric using information from CLE, arriving at a \$20.60/departure cost. Without explanation, EPA simply discarded the CLE-derived figure in favor of the much lower MKE-derived figure. EPA thus deems one airport to be representative of the entire industry in favor of another, though it offers no explanation as to why one airport could be representative of the entire industry or why MKE is more representative than CLE. As discussed elsewhere in these Comments, we do not believe a valid per-departure metric of CDP O&M Costs could be derived, and not on the basis of data from a single airport. What is questionable here is the appearance of selection of data based on outcome rather than data quality.

EPA’s asserted reason for relying on the MKE is flatly contradicted by the Record. In the TDD, EPA states:

Because no annual O&M cost data for deicing pads were provided in responses to the airport questionnaire or available at the time of model development, EPA used block-and-pump cost data, but subtracted the rental cost for temporary storage tanks.²³⁹

In other words, EPA claims that it relied on this MKE “block-and-pump” data to derive its metric indirectly because no direct data on O&M costs were provided by airports in response to the questionnaires. This is at odds with EPA’s description in Document - 0845 (dated March 2008) of the CLE data it rejected, which reads:

According to comments included in the Cleveland-Hopkins airport questionnaire, the estimated annual cost for the deicing pads is approximately \$4 million per year. Discussions with Cleveland-Hopkins environmental personnel (see telecom dated March 17, 2008) indicated that approximately \$2.5 million per year is for

²³⁹ TDD at 11-17.

capture and treatment of the spent ADF by the Northeast Ohio Regional Sewer District (POTW). To estimate the cost for treatment of the wastewater by the POTW, ERG obtained monthly flow data from Cleveland-Hopkins. According to the data provided, Cleveland-Hopkins discharged 4,281,000 gallons of ADF contaminated stormwater to the POTW in December 2007. Assuming this is a typical monthly flow and deicing operations occur for approximately 4 months per year, then the total annual volume of ADF contaminated stormwater discharged to the POTW is approximately 17,125,000 gallons per year. A search of the POTW's web site determined the cost for treatment of wastewater is approximately \$0.005/gallons. Assuming a typical annual flow rate of 17,125,000 gallons per year and a treatment cost of \$0.005/gallon the Cleveland Hopkins airport pays approximately \$86,700/yr for treatment by the POTW. If the annual budget for collection and treatment is \$2.5 million per year, then costs for collection alone are approximately \$2.4 million/year. If the typical number of annual departures at Cleveland Hopkins is 116,569/year, then the normalized annual cost for collection of ADF impacted stormwater is approximately \$20.60/departure.²⁴⁰

The substance of the March 17, 2007, teleconference referred to above is reported in Document - 0820 as follows:

Called Ms. Kim McGreal with the Cleveland Hopkins Airport regarding her costs included in the survey for capital and operating costs for their new centralized deicing pad system. According to Ms. McGreal, Cleveland Hopkins installed a new centralized deicing pad system at Cleveland Hopkins airport in 2006. All aircraft are now deiced on this pad system. . . . Operating costs in the survey are estimated at \$4 million per year. According to Ms. McGreal this includes application of fluid (and the fluid itself), collection of the spent fluid, and treatment of the fluid at the POTW. According to Ms. McGreal, approximately \$2.5 million per year is for collection and treatment, while another \$1.5 million to \$2.5 million is for fluid application. Ms. McGreal did not have costs for treatment of the fluid at the POTW but would provide via email. She indicated that if we subtract the POTW annual cost from the \$2.5 million for annual cost related to collection and treatment, we can calculate the actual cost for just collection of spent fluid.

Thus, not only did EPA have O&M cost data from CLE, it was direct and more accurate than the information it relied upon from MKE. Yet EPA adopted (again, without explanation) the MKE (\$8.87-per-departure) metric rather than the CLE (\$20.60-per-departure) metric.

²⁴⁰ Document - 0845 at 2-3.

5. The Formulas for AFBR Capital Costs and AFBR O&M Costs Are Arbitrary

The formula for calculating AFBR Capital Costs has five variables:

- COD Load Normalized Cost (\$/lbs./day)
- Applied ADF (PG/EG gallons applied per deicing season)
- COD pounds/gallon ADF
- ADF Capture Percentage
- AFBR Operating Days

To simplify the discussion, we note that applied ADF, COD pounds/gallon ADF, and ADF capture percentage are all variables that determine COD loads at a given airport. Thus, EPA's formula for estimating capital costs can be reduced to three elements: (1) COD Load Normalized Cost, (2) COD Load, and (3) AFBR Operating Days. Reduced to these elements, EPA's formula for calculating AFBR Capital Costs can be expressed as follows:

$$\frac{(\text{COD Load Normalized Cost}) \times (\text{COD Load})}{\text{AFBR Operating Days}}$$

The formula for estimating O&M costs is the same, the only difference being the value used for COD Load Normalized Cost: the value for capital costs is \$1,659 (although, as discussed above, EPA, without explanation, uses \$790 to calculate costs for Tier One airports) while the value for O&M costs is \$77.72. Here, we address each component of EPA's formula for estimating AFBR costs in turn to illustrate that it is arbitrary in many respects.

a. COD Load Normalized Cost

This component of the formula is intended to reflect a fixed, uniform cost of treating a pound of COD each day. To be reasonable, a COD Load Normalized Cost must both (a) accurately reflect costs and (b) reasonably "normalize" costs. EPA's formula fails on both counts.

i. EPA's values for COD load normalized cost do not accurately reflect costs

In Section VI (A)(2)(b) we have already demonstrated that, in deriving its AFBR capital costs, EPA failed to include the cost elements it claimed to. Specifically, EPA failed to include all storage costs incurred at ALB. As noted above, correction of this error, together with using the amount ALB actually borrowed to finance construction of additional elements of its AFBR system, would yield a COD Load Normalized Cost for estimating capital costs for AFBRs that is much higher than the value used by EPA. Had it included all the costs it said it did, the value for estimating AFBR Capital Costs would be \$3,218, not the \$1,659 erroneously derived by the Agency.

Similar errors were also made in the analysis of operating costs for AFBR treatment systems. Specifically, EPA utilized operating data from ALB and the estimated operating costs for CAK. For both of these costs, EPA indicated that the operating costs included both

wastewater storage and operating equipment annual costs. However, analysis of operating and maintenance costs submitted by CAK²⁴¹ airport indicates the following:

- O&M costs are ‘projected’ and are not based on actual costs.
- O&M costs do not include wastewater storage annual costs associated with tank cleaning, inspection and general maintenance.
- CAK O&M costs appear to be underestimated compared to ALB costs. For example, the CAK facility has a capacity of 65% of the ALB facility, thus, costs for sludge disposal should be approximately 65% of the ALB costs. CAK has estimated \$5,000 for sludge disposal compared to an average of \$16,900 for ALB.²⁴² If annual costs are truly related to COD load, then sludge disposal costs of nearly \$11,000 would be predicted. Similarly, CAK estimates \$30,000 for utilities. In contrast, ALB spends \$101,000 on average for utility costs. Again, based on COD loading, a utility cost of \$65,000 would be expected.

Based on the above analysis, the “projected” costs for CAK are underestimates of actual costs and are not appropriate for cost estimation of operating costs for AFBR treatment systems. Further, the selection and use of the CAK projected operating costs fails to include estimated maintenance costs associated with AFBR influent storage tanks.

As pointed out above, EPA also failed to include significant expenditures planned at ALB to replace/rehab the existing lagoon. Given that the source of influent water to the AFBR system is essentially stormwater, it will contain sand, grit and other debris. Tanks and lagoons must be periodically cleaned of this debris to maintain them in adequate operating conditions and protect downstream equipment. Thus, costs for tank and lagoon rehabilitation should be included in annual maintenance costs.

The use of projected annual costs for the CAK facility as well as the failure to include tank/lagoon rehabilitation costs for ALB results in an underestimate of annual AFBR costs. Projected annual costs for the CAK facility should be deleted and adjusted costs for the ALB facility, which includes certain rehabilitation of the system, should be utilized. At a minimum, annual costs for the AFBR system are underestimated by 26% and likely more.

ii. **“Normalizing” AFBR costs on a \$/COD load/say basis is not reasonable**

The use of COD load as a normalizing parameter is a significant and unwarranted oversimplification of the approach to designing AFBR systems. AFBR treatment system design, while a function of influent COD load, is primarily based on COD loading per cubic foot of media. Although the ALB system is capable of treating a higher daily load of COD, the ALB system has a calculated influent design loading of 0.63 lb COD/ft³/day compared to the CAK system which has a calculated design loading of 0.9 lb COD/ft³/day. This difference in design

²⁴¹ Document - 0803.

²⁴² Document - 0805.

loadings can make a significant difference in system sizing. For example, for JFK, a system designed based on the ALB loading would consist of 5 reactor vessels. In contrast, for JFK, a system designed based on the CAK loading would consist of 14 reactor vessels. These differences in vessel sizing are substantial and would have significant cost implications.

EPA utilized construction, operation and maintenance costs for AFBR treatment systems installed at ALB and CAK to develop a cost metric for estimation of AFBR installation and operational costs at covered airports. EPA normalized the costs to the COD loading rate. As noted in the TDD, EPA attempted to normalize AFBR cost to design flow;²⁴³ however, the use of flow was rejected as a normalizing parameter because there did not appear to be a relationship between the flow rate and AFBR cost observed at CAK and ALB. In evaluation of each system, the basis for this difference is evident. CAK collects stormwater containing deicing fluid from a deicing pad resulting in relatively high strength influent. In contrast, the ALB collection system is comparable to a gate collection system resulting in lower strength stormwater. While the cost of the AFBR can be related to the daily load, the concentration and required flow have a significant impact on overall system cost with respect to storage capacity and space allocation.

Discussions of AFBR reactor costs with Roger Owens (a designer of the ALB reactors) indicated that costs for a reactor are inversely proportional to COD load at lower COD loading rates (*i.e.*, reactor costs in terms of cost per pound of COD treated increase with decreasing COD daily loading). This is not surprising and one only has to look as far as RSMeans Building and Construction Cost data to see that for basic equipment (*e.g.*, storage tanks) cost per gallon increases as storage volume decreases. Put another way, the cost of a reactor capable of treating 1,000 lbs. of COD per day will be more expensive on a \$/cubic foot basis compared to a reactor sized to treat 4,000 lbs. of COD per day. Since the physical size of the reactor is directly related to treatment capacity, smaller reactors with lower treatment capacity will cost more. In addition, all AFBR systems, no matter what their size, will require basic components such as chemical dosing systems, gas handling systems, sludge handling systems, storage tanks, in-line monitoring equipment and process control systems. For many of these components, cost is relatively insensitive to size: a pH monitoring system will cost the same regardless of the size and capacity of the reactor. Further, installation costs are not expected to change significantly between a reactor sized to treat 4,000 lbs. of COD per day versus a reactor sized to treat 1,000 lbs. per day: they both require the same amount of time and labor to install; they both have the same number of physical piping connections to make. Thus, the cost per pound of COD treated per day will increase as the size of the AFBR system decreases. EPA's assumption of a constant cost per pound of COD treated per day is incorrect and results in an underestimation of system costs for smaller AFBR treatment systems.

b. AFBR Operating Days

As pointed out above, because AFBR Operating Days is a denominator in the equation, the longer an AFBR system operates the lower the Capital and O&M costs. This cannot make sense with respect to O&M costs. As the duration of system operation increases, increased labor

²⁴³ TDD at 11-23.

hours are incurred, the system experiences more wear and tear, system maintenance and repair increases, labor hours associated with system operation increases and system oversight/management increases. Thus, clearly, the cost of system operation increases with the duration of operation, not decreases as EPA has assumed. Review of the ALB operating data indicate, that with the exception of electrical costs, the highest cost line item is labor. Thus, with respect to O&M costs, the longer a system operates, the higher the labor costs.

With respect to AFBR capital costs, EPA also used the AFBR Operating Days to calculate the average daily COD loading to the treatment system and estimated costs accordingly. On the surface, this makes sense: for a given airport COD load, the longer the treatment period, the lower the daily COD loading to the treatment system and the smaller the treatment system required to handle the daily load. However, this is a very simplistic perspective. The size of a treatment system is determined based on many airport-specific variables. At a minimum these include the number of operations, method of stormwater collection and the frequency, duration and intensity of deicing events. Depending on these site specific conditions, the system design engineer and the airport authority will make tradeoffs between increased system size and storage capacity. At airports with frequent deicing events (resulting in a steady inflow to the collection system), the installation of a larger system can reduce storage costs. Alternatively, a smaller treatment system may require more storage, thereby increasing storage costs. The point is that the size of a treatment system required at any airport is based on many site-specific variables with the number of operations and deicing event frequency and intensity being critical to the sizing of a system.

6. The Metric for GRV Costs Is Arbitrary

In developing its cost metric for implementation of GRV collection technology at an airport, EPA assumed that the number of deicing outfalls approximates the size of the deicing area. Thus, according to EPA, the more outfalls receiving stormwater impacted by aircraft deicing activities the more GRVs that are required. EPA utilized data from six airports in the development of normalized cost of GRV capital costs per deicing outfall. Although EPA does not identify the specific airports, it appears that they are MKE, ANC, CVG, SLC, PDX and BUF based on responses to the airport questionnaire. A total of 22 airports provided cost information to EPA related to GRV capital costs and 19 airports provided GRV O&M costs. However, no explanation is provided as to why EPA selected these 6 airports.

EPA's approach to developing a cost metric for implementation of GRV collection technology is flawed in many aspects ranging from the initial assumption that the number of GRVs an airport utilizes is related to the number of deicing outfalls to final calculation of estimated technology costs at an airport. These errors are discussed in detail below.

The data EPA marshals to support its contention that the number of GRVs utilized by an airport is related to the number of deicing outfalls actually demonstrates the opposite. Those data indicate that the number of GRVs deployed at an airport ranges from one GRV per 2 outfalls to one GRV per 5 outfalls.²⁴⁴ In addition the Record data reflects that the ratio of the

²⁴⁴ TDD at 11-15.

amount of ADF per outfall at Tier Two airports will range from 609 gallons of ADF at OME (5 “deice” outfalls; estimated to use 3,047 gallons of ADF annually) to 177,307 gallons at MHT (1 “deice” outfall; estimated to use 177,307 gallons of ADF annually).²⁴⁵ Common sense would dictate a far different relative level of GRV deployment at these airports.

The chart showing the relationship between the number of deicing outfalls and the amount of ADF to be collected at all Tier Two airports (provided above in Section VI(C)(2)) demonstrates that there is in fact no meaningful correlation between EPA’s estimate of the number of GRVs needed and the amount of fluid to be recovered. Indeed, the number of GRVs utilized at an airport is not related to the number of deicing outfalls and is a function of other variables. For example, in the case where all deicing at a large airport is conducted within a single outfall, multiple GRVs are likely to be required to ensure collection technologies are available during peak deicing periods. Considerations in the purchase of a GRV include peak departure rate, proximity of deicing area to GRV off-loading locations, time associated with GRV collection and discharge (emptying) cycles, predominant weather conditions and ramp congestion (*i.e.*, can a GRV safely maneuver within the collection area prior to arrival of other aircraft). MWAA (owner/operator of IAD and DCA), for example, requires contractors to vary the number of GRVs deployed depending on the type of storm event.²⁴⁶

Second, the use of a per-outfall metric does not reflect the reality of deicing operations. The rationale for using this metric is that “ERG assumed that the number of deicing outfalls would be an approximation of the size of the deicing area; more deicing outfalls would indicate a larger deicing area and increased costs associated with removal of ADF from that area,” an explanation that EPA recapitulates in the TDD.²⁴⁷ While the total size of the area is a factor, it is not the only factor. As pointed out above, the proximity and operational characteristics of each of the areas comprising the total area will determine GRV deployment. In addition, this is especially true when the object is to achieve a specified level of ADF collection efficiency, which is affected by storm type, time of deicing operations, time available between aircraft deicing operations, etc.

The cost metric ultimately developed by EPA estimates a capital expenditure of \$108,000 per deicing outfall for GRV equipment.²⁴⁸ As pointed out above, EPA failed to consider current purchase price of a GRV, citing a 1999 report (Document - 0833) which also states that the cost

²⁴⁵ For number of outfalls see Document - 1091, Table Q1-11b, last column, titled “NumDeice”; ratios are estimated ADF usage /outfalls as reported by EPA.

²⁴⁶ STATEMENT OF WORK FOR AIRCRAFT DEICING FLUID RECOVERY, DISPOSAL, AND RECYCLING MANAGEMENT SERVICES FOR WASHINGTON DULLES INTERNATIONAL AIRPORT AND RONALD REAGAN WASHINGTON NATIONAL AIRPORT (May 2009).

²⁴⁷ Document - 1100 at 7; TDD at 11-14.

²⁴⁸ As noted in Section VI.B.4.a of these comments, Although EPA stated that a cost of \$108,000 per deicing outfall was used to calculate GRV capital costs (TDD at 11-15), they actually utilized a cost of \$123,165 (Document - 0634) to calculate GRV capital costs. No explanation is provided for this difference.

of a sweeper and associated equipment is \$400,000. Further, utilizing the GRV capital costs provided in the TDD, an average GRV cost of \$415,000 can be calculated.²⁴⁹

EPA's assessment of O&M costs for GRVs is similarly flawed for all of the reasons noted above. The assumption that GRV maintenance cost is related to the number of deicing outfalls does not make sense. While GRV capital costs appears to have a limited variability (ranges from \$315,000 to \$910,000 – a factor of 3), O&M costs range from \$5,200 to \$82,400 per year – a factor of nearly 16. Review of data reported in the Airport survey but not utilized by EPA indicate a similar range with a maximum O&M cost of \$75,633 per GRV per year reported at BWI (2006\$). Maintenance of GRV equipment is a function of weather conditions and hours of use. Airports with limited deicing will have limited O&M costs for GRVs. In fact, the lowest cost O&M is for CVG – an airport that has indicated that GRVs are used “sometimes”²⁵⁰. In these instances, O&M costs are likely to be lower compared to airports which utilize GRVs as the sole mode of deicing stormwater management. Given that the majority of the airports used in the development of GRV costs generally do not rely solely on GRV collection technology, the O&M costs are underestimates.

As explained below, EPA does not provide sufficient basis for demonstrating that GRVs used alone will achieve the required ADF Collection Standard for Tier Two airports (20% of available ADF). The cost metric is arbitrary in that it is based on information from six airports, four of which there is no basis to conclude GRVs achieve this standard. In addition, the relationship developed by EPA also is not reflective of collection technology costs actually required to comply with the requirement that “all deicing activities shall take place in an area where available ADF is *actively* collected by GRVs.”²⁵¹ During deicing periods when the GRV must be taken out of service to empty the tank, the airport would either have to cease deicing operations or maintain back-up equipment to ensure collection within the deicing area. Thus, EPA's cost analysis for implementation of the GRV collection technology at Tier 2 airports is arbitrary and inherently flawed in that it is based on costs from airports for which their ability to comply with the proposed rule based solely on GRV collection is not known, assumes that GRVs can be purchased in portions and fails to relate GRV collection requirements to meaningful and relevant metrics.

7. The Metric for Tank Costs Is Arbitrary

EPA's metric for assessing holding tank costs is manifestly arbitrary.²⁵² The core of the problem appears to be EPA's constant attempt to “normalize” costs in terms of aircraft

²⁴⁹ Note that EPA indicates that only one GRV is in use at PDX, however the calculations appear to indicate that there are 2 GRVs at that airport. The average presented above is based on the assumption that there are 2 GRVs at PDX.

²⁵⁰ Document - 0502.

²⁵¹ Proposed §449.20(b)(1)(i)(A) (emphasis added).

²⁵² EPA explains its methodology for deriving holding tank costs in the TDD at 11-28 to 11-29; this essentially recapitulates the explanation provided in Document - 0853.

departures. The result here is to derive the following formula for estimating costs of holding tanks:

$$\text{Cost} = (\text{number of annual departures}) * 24 * \$1.67$$

EPA relied on data from five airports (DIA, CAK, PDX, PIT & CVG) to derive this formula. The 24 is the average of the storage tank volume per departure at three of these airports: PDX (21), PIT (20) and CVG (32); the \$1.67 is the average of storage tank capital costs per gallon of storage capacity at another subset of three airports: DIA (\$1.89), CAK (\$1.93) and CVG (\$1.18). EPA “explains” it did not include DIA and CAK in the “gallons-per-departure” because they “appeared to be outliers.”²⁵³ (This is notable because, as pointed out above, EPA relies on CAK as just one of two airports to derive the cost metric for the most costly aspect of the Proposed Rule – AFBR capital costs; also, the Agency relied on CAK as one of just three airports to derive the cost metric for the second most costly aspect of the proposal, CDP capital costs). It did not have cost data for PDX and PIT.

That this “methodology” produces a manifestly inaccurate result should have been evident to the Agency. Applying the “formula” to CAK, the only airport cited that uses tanks for 100% of its storage needs, yields the following result:

$$\text{Cost of tanks at CAK} = 14,911 * 24 * \$1.67 = \$597,633$$

This result is fully 80% lower than the \$2,890,000 in costs actually incurred by CAK, a value EPA uses in deriving its metric. Moreover, using the metric the two airports projected to incur the largest costs are IAH and PHX, which the metric predicts would each spend about \$9 million on tanks, in 2006\$.²⁵⁴ Tellingly, PHX ultimately was not “assigned costs for management of spent ADF” because it “reported no ADF usage and no SOFP days,” while IAH also was not assigned tank costs because it was assumed this airport would “contract collection and off-site disposal of spent ADF.”²⁵⁵ While this make-shift “fix” may be a useful means of avoiding the obviously erroneous conclusion that two airports, both of which are in very warm weather climates and one of which is among the most arid in the country, would need to spend more than another facility to store ADF-laden stormwater, it does not obviate the need to address the fundamental problem: *i.e.*, that the metric generates such manifestly unsupportable results in the first place.

We also note the Agency applies an unexplained 0.33 “scaling factor” to tank costs when calculating capital costs at Tier One airports.²⁵⁶ Application of this scaling factor effectively cuts the values for expected tank capital costs for Tier One airports by 67%; as a result, many

²⁵³ Document - 0853 at 2. We note that EPA lists the “total storage tank volume” for DIA as 420,000; yet its own Engineering Site Visit Report for the airport (Document - 0513) reports that DIA has five 420,000 storage tanks at its recycling plant (page 5), for a total of 2,100,000 gallons of tank storage capacity. Of course, this pales in comparison to the 61,600,000 gallon capacity of the airport’s six ponds (page 6).

²⁵⁴ See Document - 0634 at sheet “CstAnnual,” Column DV.

²⁵⁵ Document - 0851.

²⁵⁶ See Document - 0634, worksheet “CstAnnual,” CG2.

Tier Two airports with far fewer operations and in much milder climates are projected to incur much higher tank capital costs than Tier One airports.

Even apart from these results, EPA is well aware that the volume of stormwater generated at an airport is predominately a function of two things: Existing airport infrastructure (amount of pavement from which stormwater is collected) and climate (type and intensity of storms experienced at a particular location). Document - 0852, entitled *Methodology to Estimate the Total Volume of Airport Stormwater Impacted by ADF*, does not even mention departure levels. Finally, as noted above, the amount of stormwater collected at a particular airport is a result of balancing various factors, including sizing AFBRs – a per-departure metric simply does not reflect the real factors that drive tank costs and, unsurprisingly, is cannot a reliably predict such costs.

8. The “Metric” for Piping Costs Is Arbitrary

EPA assumes a uniform \$502,000 cost (calculated cost of 1,000 yards of piping) for all airports.²⁵⁷ This is a gross simplification, which leads to a gross underestimation of actual capital costs for piping. This is based on the assumption that just 1000 feet of piping would be required any airport. This underestimates real costs for piping by a wide margin – for example, construction of treatment facilities at PDX (an AFBR) will require 12,705 linear feet of piping and 4 pump stations, at an estimated cost of \$1,067,733 per 1000 feet of piping.²⁵⁸

VII. EPA’S DESIGNATIONS OF BAT ARE NOT SUPPORTED BY THE RECORD

A. EPA’s Designation of BAT for ADF Collection at Tier One Airports Is Not Supported by the Record

1. EPA’s Designation of 60% Collection Efficiency as BAT for ADF Collection at Tier One Airports Is Not Supported by the Record

The basis for EPA’s designation of the 60% collection standard as BAT for ADF Collection at Tier One airports is not clear. There are two issues: (1) whether the standard is based on the Agency’s estimation of the collection efficiency of CDPs exclusive of other collection technologies – *i.e.*, the collection efficiency achievable by operating CDPs independent of other collection technologies; and (2) the analysis used to determine the numerical collection efficiency designated as BAT.

The first issue has been resolved through communication with EPA staff, who have confirmed that the 60% collection standard is based on the operation of the model technology, CDPs, operating exclusive and independent of all other collection technologies including GRVs.²⁵⁹ This is consistent with the statement in the Notice that EPA estimates that CDPs

²⁵⁷ TDD at 11-26. The precise cost used in its Airport Cost Model is \$502,306 (Document - 0634, “CstAnnual” worksheet, Column DZ).

²⁵⁸ PDX line item budget. *See* Attachment 2.

²⁵⁹ Telephone conference between E. Strassler, EPA, and T. Pohle, ATA (February 2, 2010).

“allow airports to capture about 60% of the available ADF.”²⁶⁰ This also is consistent with EPA’s costing methodology, which did not consider GRVs or other supplemental collection technologies as contributing any element of the cost expected to be incurred by Tier One airports.²⁶¹ In addition, the technical specifications for CDPs deemed to meet the proposed 60% capture requirement require only that the CDP be “equipped with a fluid collection system, such as a perimeter trench and diversion valve . . .” without mention of GRVs or other technologies.²⁶² We are appreciative that the Agency has resolved the ambiguity, which also emerges from other parts of the Notice.²⁶³

Unfortunately, the Agency has not provided a clear basis for its determination that CDPs achieve a 60% collection efficiency and, therefore, that CDPs achieve the proposed BAT for ADF Collection at Tier One airports. In the TDD, the Agency reports that the determination that CDPs achieve a 60% collection efficiency is based on a review of “data on the performance of centralized deicing facilities across the United States and Europe.”²⁶⁴ However, of the documents the Agency cites in the TDD, a copy of only one is included in the Record. When asked whether the other documents were available, Agency staff reported that “they are not in the docket nor were they used in our findings or analyses.”²⁶⁵ Subsequently, we were informed

²⁶⁰ Notice at 44686, col. 3.

²⁶¹ We note that in Section 11.1 of the TDD, entitled “Summary of Costs,” EPA indicates that the “60% Efficiency Scenario” “includes deicing pads with GRVs and AFBR treatment.” TDD at 11-1. EPA also states that it “decided to estimate costs for three collection options,” including “centralized deicing pads in combination with GRVs.” TDD at 11-11. In addition, in Section 11.3 of the TDD (entitled “General Methodology for Estimating Collection and Treatment Technology Costs”), subsection 11.3.2.1., EPA identifies “Deicing Pads with GRVs” as one of the “Collection and Control Alternatives for Spent ADF.” TDD at 11-16. There, EPA notes that “[a] number of airports also use GRVs in combination with centralized deicing pads to maximize collection and containing ADF-contaminated stormwater.” The record flatly contradicts these statements to the effect that GRV costs are included in its estimation of costs associated with 60% collection. Nothing in the discussion of costs on page 11-17 of the TDD discusses GRVs. In addition, the Airport Impact Model (Document – 0634) makes clear that the formula used to calculate the “Deicing Pad 3c Capital Costs” (see “CstAnnual” Worksheet, column CG) has five components: (1) deicing pad (column ET), (2) tanks (column DV), (3) piping (column DZ), (4) AFBR (column GD), and (5) monitoring and engineering cost (column GQ). GRV costs are not in any of these components.

²⁶² Proposed § 449.20(b)(1)(ii). We note that a CDP could, in some sense, be “equipped with” a GRV, but the most natural reading of the provision is that the provision refers to appurtenances that are not separable from the CDP itself.

²⁶³ For example, the Agency observes that “some airports use GRVs in combination with CDPs in order to maximize collection and containments of ADF-contaminated stormwater,” we understand its 60% estimate of the collection efficiency is exclusive of any GRV activity. Notice at 44684, col. 3. In addition, Table VII-2 in its Notice refers to “Centralized deicing pad + GRV” as the “technology basis” for the “60% ADF Capture” and “20% ADF Capture” requirements without unambiguously clarifying that “Centralized deicing pad” is the intended “technology basis” for the 60% requirement and “GRV” is the intended “technology basis” for the 20% requirement. Notice at 44691.

²⁶⁴ TDD at 9-4.

²⁶⁵ Email from R. Reding, EPA, to T. Pohle, ATA (January 27, 2010).

that the references to the other documents included in the TDD would not be included in the “final” development document and that EPA had instead relied on Document - 1124 and perhaps Document - 0833.²⁶⁶

This raises obvious issues regarding whether the Agency has provided proper notice of and opportunity to comment on the basis of its Proposed Rule. The documents EPA now claims to have relied upon in reaching the conclusion that CDPs “allow airports to collect 60 percent of the available ADF” provide no basis for making that determination. Document - 0833, a report from 1999 provides no analysis of the collection efficiency of CDPs. Document - 1124 (ACRP Report No.14), also provides no basis for EPA’s determination. While Document-1124 lists centralized deicing facilities as having a performance range of “44 to 86 percent of applied glycol,” the document also states clearly that there is no statistical basis for that claim and the information should not be relied upon.²⁶⁷ The report makes its limitations clear:

The accuracy of performance characterizations is limited by a variety of factors In many cases, available data is representative of an airport’s deicing stormwater management system as a whole, rather than of a single component of the system. . . . there is *no statistical basis for the source data*, and *under no circumstances should this information be interpreted as what could confidently be achieved at another airport*.²⁶⁸

. . .
Values shown represent extremes of reported or estimated performance from available information from a limited number of airports. *No assumption should be made* regarding the *distribution of performance metrics between these extremes*.²⁶⁹

EPA’s reliance on this data for determination of CDP collection efficiency and application across airports is contrary to the express limitations of the document. Nevertheless, Document - 1124 appears to be the only basis for EPA’s designation of 60% as the collection efficiency of its BAT model collection technology.²⁷⁰

²⁶⁶ Telephone conference between E. Strassler, EPA, and T. Pohle, ATA (February 2, 2010).

²⁶⁷ TDD at 9-5.

²⁶⁸ Document – 1124 at 30 (emphasis added).

²⁶⁹ Document – 1124 at 31, Table 3-2, note *a* (emphasis added).

²⁷⁰ In the TDD, EPA also asserts that “[s]everal airports reported a relatively consistent efficiency of around 60 to 66 percent over varying winter seasons.” TDD at 9-5. This is cut and pasted directly from Document - 0744, a memorandum from EPA’s consultant ERG. In that memo this assertion is supported by the following footnote: “Deicing pad collection estimates were determined using industry collected data submitted to EPA. For specific data see DCN XXX Glycol Recovery Collection Memo (December 2007).” In other words, there is no support provided and the document in which it reportedly resides is not properly identified; the “DCN XXX” document which ERG apparently intends to refer is Document - 0744, which is devoid of any information regarding collection efficiencies of deicing pads.

Finally, not only is the existence of data to support EPA's decision lacking, the Agency has not provided an explanation of how it evaluated the documents that were cited in the TDD to arrive at an estimated collection efficiency. The Agency merely asserts that "[b]ased on this information, EPA *estimates* that facilities effectively operating a centralized deicing pad recover 60 percent of applied glycol."²⁷¹ Absent any explanation of its methodology for making the estimate, to the extent one existed, it is impossible to ascertain the validity of the Agency's reasoning or the validity of its "estimate."

The importance of getting some explanation of the Agency's reasoning is highlighted by the now disavowed examples included in the TDD. For example, to understand whether any particular estimate of collection efficiency has any basis, it is necessary to understand how the collection efficiency achieved by CDPs alone is determined where collection has been achieved using multiple collection technologies. However, every U.S. airport cited in the TDD reports the use of multiple collection technologies that contribute to collection efficiencies. The description of BWI operations in the TDD acknowledges that CDPs are "coupled with" other collection technologies;²⁷² the Site Visit Report on PIT establishes that GRVs are used in combination with deicing pads;²⁷³ and the Sampling Episode Reports for DTW establishes that "[d]eicing fluid collection is augmented in and around the remote deicing pads using GRVs."²⁷⁴ With respect to DIA, EPA's Site Visit Report (Document - 0513)²⁷⁵ establishes that DIA has supplemented the collection of ADF at its pads with a massive "fugitive collection system which included stormwater collection from a larger area of the concourse and parts of the winter departure runways." (See the outlined area in the upper left corner of Figure 1 [reproduced below]).²⁷⁶ DIA also has another large collection system known as the "West Airfield Diversion System" and has "connected several utility corridors to a diversion system that feeds to the DIA stormwater system."²⁷⁷ In addition, it also is not clear from the data and analysis, how collection efficiencies are calculated – for example, whether BOD or COD collected is attributed in calculations to ADF or to other potential sources of oxygen demand as well (for example, pavement deicers or other organics).²⁷⁸

²⁷¹ TDD at 9-5.

²⁷² TDD at 9-5 (emphasis added).

²⁷³ Document – 0509 at 6 ("EQ [the airport's contractor] has purchased 2 GRVs, each with a 1,200 gallon capacity, for collection of deicing fluids during ramp defrosting activities and after deice pad operations have ended for the day); *See also* Document – 0409 (EPA's Final Sampling Plan for PIT) at 2-2 ("To complement the existing infrastructure and to address gate defrosting activities, EQ is using [GRVs]").

²⁷⁴ Document - 0688 at 2-2.

²⁷⁵ TDD at 11-16.

²⁷⁶ Document - 0513 at 6.

²⁷⁷ CDM, *Denver International Airport – Stormwater Management Plan* (August 2004) at 2-11.

²⁷⁸ Relying on information from European airports, as EPA did in the TDD, is problematic, especially since deicing operations at European airports run on a completely different model than do operations at U.S. airports. Moreover, Oslo – one of the two European airports EPA cites -- was built virtually from scratch during the mid-1990s, allowing it to avoid the many difficulties encountered when attempting to

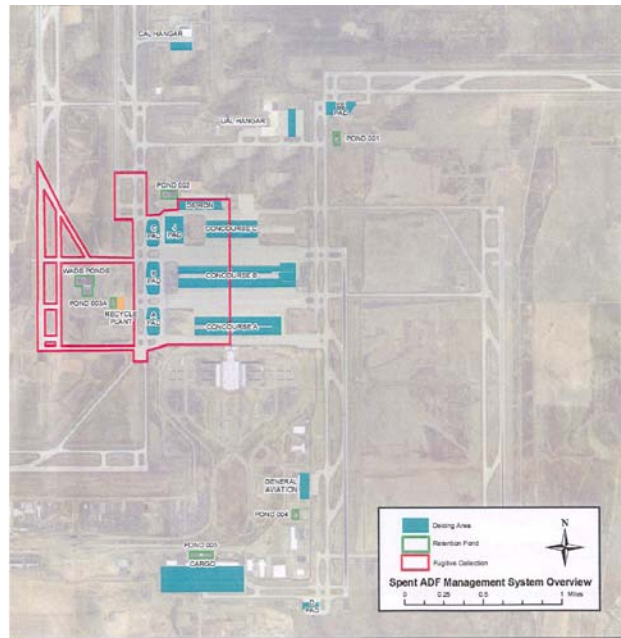


Figure 1. Map of Denver International Airport

2. **EPA’s Determination that BAT for ADF Collection for Tier One Airports is “Available” Is Not Supported by the Record**

In its Notice, EPA states that it “finds that for the top fourteen airports in terms of annual ADF usage [*i.e.*, Tier One airports], collection of ADF based on the use of deicing pads is technologically available.”²⁷⁹ The Agency’s designation of BAT for ADF collection at large airports rests upon its determination that land is available, even at land constrained airports, to install and operate pads, as EPA explains in its Notice:

EPA’s record indicates that at least seven of the fourteen airports already have installed deicing pads. For the remaining seven, EPA examined what appeared to be the most land-constrained airports and using a formula based on number of departures and number of runways, estimated the amount of land that would be required for installation of deicing pads. EPA then reviewed airport site plans provided in the questionnaires and determined that these constrained airports have sufficient land to install the necessary collection technologies. *See* the TDD for further discussion on the estimated land availability for deicing pads. **Therefore**, the Agency

engineer collection and treatment systems within the constraints of the existing facilities EPA proposes to regulate here.

²⁷⁹ Notice at 44692, col. 1.

determined that *economic achievability is the controlling factor* in identifying which option represents BAT for collection of ADF.²⁸⁰

Thus, the “land availability” analysis is the keystone in the structure of its decision to designate CDPs as BAT. As already noted above in Section IV(A)(1), EPA identified Document - 1171 as the basis for its “determin[ation] that these constrained airports have sufficient land to install the necessary collection technologies.”²⁸¹ This Land Availability Analysis is seriously flawed in many respects which fall into three categories: failure to account for safety imperatives, failure to account for operational impacts, and failure to account for other essential design criteria. We already have discussed the failure to address safety in Section IV(A)(1) above – here we focus on the latter two categories.

However, as an initial matter, we take issue with EPA’s use of Google Earth as a tool for determining land availability for CDPs at airports. Specifically, EPA conducted the Land Availability Analysis by taking overhead images from Google Earth and drawing boxes on them to approximate potential deicing pads. This method for determining land availability is completely inaccurate and not suitable for even a rough approximation of land availability. A review of the Google Earth images in the Land Availability Analysis demonstrates that the proposed deicing pad locations are unrealistic as they cover parking lots, maintenance hangars, and large aircraft movement areas. As the subsequent subsections lay out, EPA’s analysis also fails to take safety or operational considerations into account – Google Earth certainly does not capture these dimensions. At a minimum, a suitable analysis to determine the availability of open land would involve a detailed review of airport site plans including identification of existing structures, planned capital improvements, and utilities. Such an analysis would only be a first step toward determining if the space were suitable for a deicing pad. EPA has failed to make even the most basic analysis of available land.

a. **EPA’s Determination that CDPs Are “Available” Does Not Consider Operational Factors**

The Land Availability Analysis does consider or analyze operational issues associated with CDPs.²⁸² EPA observes that FAA recommends that “before locating deicing facilities away from the terminal areas, an airport should first evaluate the use of existing taxiways that minimize the taxiing time to the facility and, more important, the subsequent taxiing time

²⁸⁰ Notice at 44692, cols. 1-2 (emphasis added).

²⁸¹ The “further discussion on the estimated land availability” in the TDD did not exist. As explained in the November 20, 2009, letter from industry associations, EPA only included Document - 1171 in the Docket after inquiries from industry. That letter is incorporated into these Comments by reference.

²⁸² Even EPA’s conceptualization of a “centralized deicing pad” does not track FAA’s distinction in AC 150/5300-14B, between “centralized deicing pads” and “remote deicing pads.” *Compare* ¶¶ 1-1(b)(1) and 1-1(b)(2); *compare also* ¶1-2(b), which defines a “centralized deicing facility” as “an aircraft deicing facility located at the terminal gates/aprons or along taxiways serving departure runways,” and ¶ 1-2(c), which defines a “remote deicing facility” as “an aircraft deicing facility located along taxiways serving departure runways or near the departure end of runways.” The failure to understand this distinction leads to a failure to inquire into or understand the operational advantages and challenges associated with each.

remaining between treatment and takeoff.”²⁸³ While EPA is right to identify minimization of taxiing time as an important consideration in location of remote deicing facilities, the strategy proposed by EPA will extend, rather than minimize, taxiing times.²⁸⁴

EPA uses Google Earth to outline potential deicing pad locations at LGA, DCA and JFK that would incorporate existing taxiways.²⁸⁵ Indeed, the Google Earth image of LGA captures two aircraft on active taxiways in the middle of one proposed deicing pad site. In addition to the fact that Google Earth is not an adequate tool for determining land availability or locating deicing pads, the incorporation of taxiways into a deicing pad would drastically disrupt and delay operations at an airport. In fact, in ¶ 2-1(b)(2) of AC 150/5300-14B, FAA lists “bypass taxiing capability” as an essential component of any remote deicing facility and explains in ¶ 2-8:

To further maximize departure flows for all departing aircraft, potential sites should have enough physical space to allow bypass taxiing capability for aircraft not needing treatment. This feature permits the facility to receive aircraft to continue unimpeded for departure.

In addition, EPA notes that “[a]ll of the [proposed pad] locations are plotted adjacent to existing runways to illustrate space availabilities in areas that would possibly ensure deicing holding times [sic] could be achieved.”²⁸⁶ Unfortunately, the proposed pads appear to be located so close to existing runways that they violate various safety standards and, were they in fact located as proposed, could require runways to be closed while aircraft were deiced.²⁸⁷

Again, this would wreak havoc on airport operations, resulting in huge increase in delays at the airports in question and throughout the NAS. The view that EPA has taken does not consider the various operational configurations that an airport may utilize, or even which runways are most often available for departures and arrivals during winter operations. An airspace analysis, runway safety review to evaluate runway crossings, air traffic operational analysis, and ground access analysis must all be performed to evaluate whether any location is viable from both a safety and operational perspective. All have the potential to eliminate any proposed site from consideration.²⁸⁸

²⁸³ Document - 1171 at 3.

²⁸⁴ While reducing taxiing times after deicing is generally beneficial, construction of remote deicing pads in the vicinity of runway departure ends often is not viable from both a safety and operational perspective. At a minimum, if a facility were approved for construction, there would be both runway/taxiway closures and navigational aid outages and associated impacts to consider.

²⁸⁵ Document - 1171 at 3 (emphasis added).

²⁸⁶ Document - 1171 at 3. EPA apparently means “holdover” not “holding” times.

²⁸⁷ *See AC 150-5300-13 and FAR Part 77 Objects Affecting Navigable Airspace.*

²⁸⁸ We also note that this analysis does not even take into consideration operational requirements built into EPA’s own understanding of how CDPs may qualify as BAT. EPA proposes to require that any centralized deicing pad deemed to comply with BAT must be used by all aircraft deiced at an airport and must be “sized to accommodate the airport’s peak hourly departure rate.” Proposed §449.20(b)(1)(ii)(A) & (D). Yet, the analysis in EPA-HQ-OW-2003-0038-1171 is devoid of any consideration of whether all

We also note that EPA's analysis fails to consider key variables in determining the number of deicing pads needed at an airport: the size, type and frequency of storm events experienced at specific airports. Again, the AC clearly spells out the need for critical information:

Variations in meteorological conditions, *e.g.*, type of precipitation, increase the extent (and frequency) of the deicing/anti-icing treatment. Airports that commonly experience heavy wet snows or freezing rain should increase the number of deicing pads to maintain departure flow rates at levels that avoid unacceptable delays for subsequent aircraft awaiting treatment.²⁸⁹

Yet, based on data from PIT, DTW and DIA, EPA concludes that a typical airport needs just 86% of a deicing pad per runway and the pad must be 9.5 square feet per annual departure. As a result, based on the derivation of this metric (which is not consistent with a metric EPA derived for estimating pad sizes in another analysis in this rulemaking),²⁹⁰ EPA assumes away the need for climate information the AC deems necessary for determining the number of pads needed (and in some cases their location). Similarly, EPA assumes away the need to consider other categories of information identified by FAA as necessary to the analysis, including procedures and methods of users, the type of aircraft receiving treatment (fleet mix) and types of deicing vehicles operated at the airport.

EPA developed "relationships" between deicing pad areas and the annual number of airport departures based on three existing facilities (PIT, DIA, and DTW). Establishing pad size and location with no reference to FAA airport design standards, or airport and airway obstruction standards is unacceptable. Compliance with FAA airport design standards is mandatory for both safety and financial reasons. Because each airport is unique, FAA recommends airports solicit input from FAA Air Traffic Control, Airports Division, Technical Operations and Flight Standards offices; Airport operations managers, environmental managers, and airport rescue and fire fighting representatives; airline station, environmental and operation managers; and a variety of other aviation related parties. None of this was done for the EPA determination of deicing pad space availability at LGA, DCA & JFK. Indeed, the basic premise that remote deicing facilities located near departure runway ends (as opposed to "centralized deicing pads" as understood by FAA and the aviation community) are recommended only when taxi times frequently exceed holdover times was never even considered.

winter operations could be served at these airports without increasing delays and, as a result, throughout the NAS. In addition, there is no attempt to determine the peak hourly departure rates at these airports and whether the proposed pads could accommodate those rates.

²⁸⁹ Document - 0741, ¶ 2-4(a)(2).

²⁹⁰ See Document - 0846, which compares the size of runways and pads at these very same airports (PIT, DTW, and DIA) and concludes pads are 20% the size of runways.

b. EPA's Determination that CDPs Are "Available" Does Not Consider Other Essential Design Criteria

As noted above, the Agency does not consider whether there is land available to accommodate the storage and treatment facilities that would be required and without which the collection BAT would be useless. Some images of storage and treatment facilities from the Record (many of which EPA staff observed in person during site visits) make plain that whether land-constrained airports would have space available to accommodate such facilities is a very significant issue:

Storage Tanks at CAK (from Document - 0834)



Storage Tank (2.5 Million Gallons) at ALB (from Document - 0206)



Storage Lagoon (6.0 Million Gallons) at ALB (from Document - 0206)



Primary and Secondary Treatment Facilities at ALB (from Document - 0206)



Moreover, the ALB and CAK systems are relatively small – systems at the large airports targeted under this rule would need to be much larger. As noted above, the AFBR alone are at least 10 feet in diameter and 35 feet in height. The buildings enclosing the reactors and/or attendant equipment add to the footprint.

AREAS FOR AFBR TREATMENT SYSTEMS

<i>Airport</i>	<i>Treatment Capacity - Design Target / Actual (Lbs. COD/day)</i>	<i>Reactor Size (ft) (2 Reactors Each)</i>		<i>Treatment Building Area (ft²)</i>	<i>Site Area¹ (ft²)</i>
		Diameter	Height		
ALB	5,400 / 7,700	14	35	2,100 ²	~16,900
CAK	3,400 / 3,900	10	32	4,400	38,600
PDX	7,700 / 7,700	14	35	10,200 ³	54,000

¹ Includes building, parking, and biogas flare areas; does not include areas for storage.

² Area includes anaerobic system only (excludes aerobic system); reactors are outside building and not included.

³Treatment-related portion of building only.

All areas rounded to nearest 100 ft²

The capacity of AFBR facilities for large airports would need to be much larger than those at ALB and CAK to accommodate the much larger COD loads associated with the higher ADF usage at those airports. A rudimentary analysis suggests that, based on EPA's estimated COD loads at these airports, LGA would require three AFBR, EWR six, and BOS five. The buildings needed to enclose the reactors and attendant facilities (*e.g.*, pre-heater, composite sampler, feed flow control valves, fluidization and foam flow control pumps, media separator, pH control, nutrient batch mixer, system control and data acquisition panel, biogas collector, dual methane gas boiler, process heat recycle loop, oxygenator, biogas flare, etc.) will also need to be much bigger than those required at CAK and/or ALB.

In addition, the stormwater collected to meet ADF Collection BAT would need to be much larger. These facilities also would have very large footprints.²⁹¹

Clearly, before it may reasonably conclude that sufficient land is in fact available to deploy CDPs, EPA must consider whether land is available to accommodate the other facilities it is requiring to be deployed under the Proposed Rule and without which deployment of CDPs would be useless. In addition, EPA also must consider whether space is available for other facilities that, especially given that under the proposal they would be designed to accommodate operations at our nation's busiest but physically-constrained airports, must accompany CDPs, including, but not limited to:

- Deicer center/tower (including operations control room and administrative offices);
- Employee facilities for truck operators and supervisory staff, including locker room, bathrooms, break room, and parking;
- Snow storage and management space (for snow removed from CDPs);
- Glycol storage, premixing and pre-heating, unloading and loading, facilities;
- Fuel tanks and fueling stations for vehicles, including deicing trucks;
- Vehicle/equipment storage and parking;
- Vehicle/equipment maintenance;
- Diversion structures (to allow diversion of high and low-strength stormwater flows); and
- Pump stations.

²⁹¹ If it is assumed stormwater storage facilities would be constructed underground, the operational and other impacts associated with construction of those facilities would need to be taken into account.

c. **EPA’s Determination that CDPs Are “Available” Is Not Consistent With Its Own Assessment that “Many of the Nation’s Airports Simply Do Not Have” the “Physical Space” Available for Capacity Enhancement**

In closing, we note that EPA’s “land availability” analysis is not even consistent with its own clearly stated view that “many” airports are so physically constrained that they are unable to devote land to expanding capacity.

Adding capacity *requires physical space, which many of the nation’s airports simply do not have*. Another barrier is that many airports are built near environmentally sensitive areas, such as waterways, that would make expansion costly *and, in many cases, prohibited*.²⁹²

If “many of the nation’s airports simply do not have” the physical space necessary to expand capacity, airports likely do not have physical space to devote to deicing pads and associated infrastructure. Moreover, as the Agency suggests, the environmental impacts associated with “finding land” to accommodate new facilities would, in effect, “prohibit” their construction (even taking into consideration their potential environmental benefits). In essence, EPA concedes that even if land is available in the theoretical sense, the costs for land constrained airports are effectively “prohibitive.”

EPA also is not consistent in its analysis in that it did come up with a standard for determining whether land/space is available for storage of ADF-runoff in retention ponds: “if an airport currently utilizes more than 35 percent of its current area for active airport operations, then it was not a candidate for a retention pond system.”²⁹³ Nothing in the Record explains how this determination was made or supports its use.

²⁹² EA at 2-16 (emphasis added).

²⁹³ TDD at 11-2 (“EPA decided to estimate costs for each storage option and, based on each airport’s physical features such as available space, select the best storage alternative.”); Notice at 44695 (“The Agency assumed that it is likely that an airport with a pond already in place would use that for storage, as opposed to constructing permanent tanks; and assumed that an airport with limited available land would install an underground tank.”); TDD at 11-24 (“To determine if space was available for a retention pond system at an airport, EPA examined the total current land use at representative airports located in urban areas. Based on the analysis, EPA decided that if an airport currently utilizes more than 35 percent of its current area for active airport operations, then it was not a candidate for a retention pond system. These airports would need to use above-ground or below-ground tanks to store ADF-contaminated stormwater prior to treatment or off-site discharge to a POTW.”) *See also* Document - 1100 at 11.

B. EPA's Designation of BAT for ADF Collection at Tier Two Airports Is Not Supported by the Record

1. EPA's Designation of 20 Percent Collection Efficiency as BAT for ADF Collection at Tier Two Airports Is Not Supported by the Record

EPA presents no data to support its “estimate” that GRVs operating alone and independent of other collection systems will collect 20% of available ADF. As it does with respect to CDPs, the Agency merely asserts that based on information listed in the TDD it “estimates” the collection efficiency of the technology “alone” but provides no explanation of the methodology used to make the estimate. The public therefore has no notice of EPA’s decision making on this point and, thus, no legitimate opportunity to comment on the Agency’s data, reasoning or conclusions.

As to the Agency’s designation of 20% collection as reflective of GRV-only collection operations, the Record is effectively empty. While EPA notes that at the airports with GRV technology, collection efficiency ranged between 22.5 and 53%, this is drawn from the same ACRP report cited with respect to CDP performance and is subject to the same limitations. In addition, the ACRP report makes clear that “the overall effectiveness of glycol collection vehicles varies based on the number of vehicles used relative to the areas and deicing activities served.”²⁹⁴ EPA makes no attempt to evaluate these factors. The cited ACRP report goes on to highlight that collection efficiency “varies based on . . . whether [GRVs] are used in conjunction with other collection methods.” The Agency also admits that all of the systems evaluated used GRVs *in combination with other technologies* but made no attempt to analyze how GRV performance is affected. These other technologies ranged from catch basin inserts to sophisticated apron or pad collection systems.²⁹⁵ Further review of the Engineering Site Visit reports indicates that alternate and multiple technologies have been applied at these airports. A few examples will suffice to demonstrate this point.

MKE uses a centralized deicing facility, diversion valves, isolation valves and a GRV.²⁹⁶ Clearly, this airport does not depend solely on a GRV. Although the airport has reported collection efficiencies of between 29.2 and 31.8%, these collection efficiencies are reflective of the totality of its deicing system, which depends on the use of a centralized deicing facility. Thus, at this airport, the actual cost of compliance with the Tier Two requirement is not just a function of the use of GRV collection technology, but a function of the application of a variety of technologies in addition to GRVs.

²⁹⁴ Document - 1125, Fact Sheet 23.

²⁹⁵ TDD at 9-4.

²⁹⁶ Engineering Site Visit Report for General Mitchell International Airport, Milwaukee, WI, June 2006. Document - 0507.

Similarly, CVG uses deicing pads with a drain diversion system.²⁹⁷ Based on the Engineering Site Visit report, the GRV component of the collection system is clearly not the primary component deicing stormwater management. Specifically, the Engineering Site Visit Report notes that the GRV is “*sometimes* used to collect ADF contaminated stormwater during deicing events” (emphasis added).

Likewise, PDX are highly dependent upon a gate collection system and the use of GRVs are considered a critical but secondary component of its complete collection system.

EPA also notes that the GRV system in combination with an apron collection system at BUF was effective in capturing 53% of the applied ADF, however, no information is provided related to the capture efficiency of the GRV collection component alone. Thus, use of this cost information is inappropriate for estimation of the cost of compliance with the 20% collection requirement because the GRV costs represent only a fraction of the system cost at BUF.

These examples make clear that EPA’s GRV efficacy data are confounded by the presence of technologies in addition to GRVs that contribute to the collection efficiencies at each cited airport. As a result, while EPA has included only GRV’s in its Tier Two capital cost, the truth is that in order to achieve the collection efficiencies demonstrated at the subject airports a great deal more infrastructure and technology beyond the GRVs themselves is required. Thus, the Agency has not successfully supported either the collection percentage of GRVs alone or the cost of achieving the collection percentages demonstrated by the airports in its database. The cost of the GRVs alone is not sufficient to produce the collection efficiencies observed at any of these airports.

In addition, EPA has not demonstrated that GRV operations sufficient to achieve the stated collection efficiency of 20% are possible in a manner consistent with safety and operational constraints at any individual airport, much less at every Tier Two airport. As described above in connection with CDP usage, safety and operational considerations effectively define the operating envelope in which candidate collection technologies must function. Where GRVs must operate quickly to get out of the way of incoming aircraft and where they must skirt tarmac on which ADF is pooled in to avoid conflicts with gates or other aircraft in especially congested gate areas, for example, GRVs will become less efficient at capturing available ADF. These safety and operational factors are multiplied here because the Proposed Rule requires that deicing is limited to areas “where available ADF is *actively* collected by GRVs.”²⁹⁸ The potential for conflicts in such a setting are obvious, and it is clear that operators of both GRVs and aircraft will limit GRV operations to ensure that such conflicts do not occur. EPA, however, has not explained what it means by “actively” or considered the impact of those conflicts and the operators’ responses to them on the actual performance of the GRVs.

²⁹⁷ Engineering Site Visit Report for Cincinnati/Northern Kentucky International Airport, Covington, KY. September 2007. Document - 0502.

²⁹⁸ Proposed §449.20(b)(1)(i)(A) (emphasis added).

C. EPA's Designation of BAT for ADF Treatment Is Not Supported by the Record

EPA has selected AFBR as the model technology for treatment of stormwater containing aircraft deicing fluid at all airports covered by the proposed Airport Deicing ELG. EPA selected this technology based on the asserted prevalence of the use of this technology in the aviation industry, the ability of the technology to reduce pollutant loadings and the ability of the technology to produce effluent which can be discharged to a local POTW or to surface water. Although AFBR treatment technology is well suited for high strength (high COD) wastewaters and has been utilized to treat a variety of industrial waste streams, the selection of this technology by EPA is arbitrary and wholly inconsistent with procedures which have been implemented at other airports in the identification, selection and application of deicing stormwater management.

We have already discussed some of the safety issues associated with this technology and the fact that the Agency did not consider them. In fact, we point out EPA entered a MOA with the FAA and other agencies in which it agrees wastewater treatment facilities are generally incompatible with airports. EPA does not address this issue at all, much less explain how the selected technology qualifies as the *best* available treatment technology. In addition, we have noted that the Agency also did not consider the need to find sufficient land to accommodate these treatment facilities at subject airports; the Agency must examine this issue as well before it can have any basis for reasonably concluding that the technology is "available" to the airports for which it is required. In this Section, we deal in detail with still other issues that independently demonstrate that the Record does not support EPA's selection of AFBRs as the technology basis for the ADF Treatment BAT.

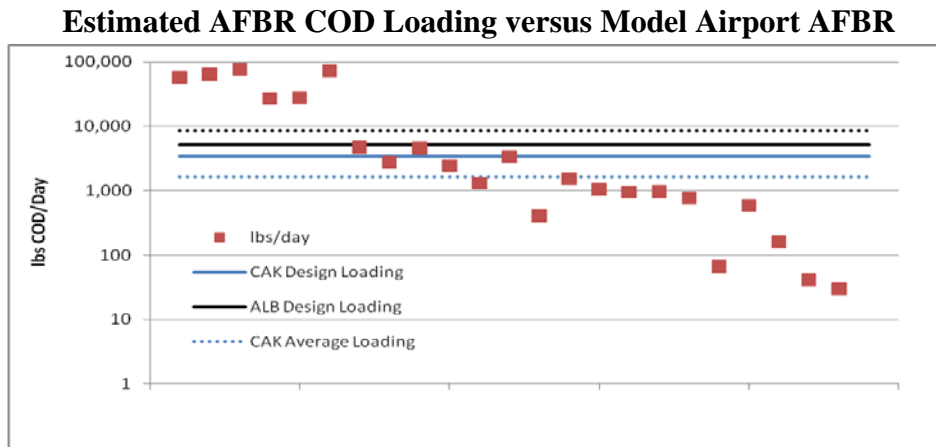
EPA points out that there are a wide variety of ADF treatment technologies that have been applied at airports nationwide.²⁹⁹ These systems include biological treatment (aerobic, anaerobic and engineered wetlands) as well as physical treatment (membrane separation (UF/RO), mechanical vapor recompression, distillation) and examples of these technologies have been constructed around the U.S. to treat various stormwaters from airport deicing operations. Clearly this is evidence that one treatment technology does not fit all operations. Airports have selected specific treatment technologies for a variety of reasons including but not limited to availability and cost of POTW treatment capacity, land availability, airport safety, ability to integrate into existing airport layout, predicted stormwater flows and loads, quantity of ADF application (to provide a consistent and substantial product stream to recycling operations), and discharge requirements. However, EPA's selection of AFBR as the treatment BAT appears to be limited to a single factor – total pollutant removal. While we understand that the selection of AFBR technology as BAT does not require airports to install AFBR treatment, the selection of AFBR as BAT ignores unique qualities of each airport and the diversity of technologies applied at airports nationwide.

²⁹⁹ TDD at Section 8.2 at 8-7 and following.

EPA has assumed that AFBR technology is applicable and scalable to all aircraft deicing management systems and will achieve the treatment limitations established based on the AFBR performance at ALB. However, out of the 153 airports surveyed, AFBR technology has only been implemented at two airports (ALB and CAK) and the operations at ALB and CAK are comparable with respect to number of departures, deicing events, and ADF application volumes.

Design engineers have been developing capture and treatment strategies at numerous airports throughout the U.S. for many years, yet only two airports currently have AFBR systems and, as EPA notes, only one other airport is in the process of constructing an AFBR system. Numerous other airports have selected other treatment options (*e.g.*, UF/RO, recycling, aerobic treatment, engineered wetlands, etc.). While these other airports could have selected AFBR technology, they did not. In using AFBR technology alone as the basis for rule making, EPA has failed to consider site specific conditions which would limit the application of this technology at all airports.

The two operating AFBR systems at ALB and CAK were designed to treat 5200 and 3400 lbs. of COD per day, respectively. Both airports have comparable winter weather and deicing operations. Therefore, while they are examples of aircraft deicing fluid management incorporating AFBR treatment, they are not representative of the range of climactic and operational conditions covered by the Proposed Rule. The majority of the AFBR systems which EPA assumes would be installed under the Proposed Rule fall outside of the narrow range of model AFBR design conditions (3,400 to 5,200 lbs. COD/day capacity). The assumed AFBR COD loading rate for all airports expected to be subject to the Proposed Rule is based on the number of deicing days estimated by EPA and the pounds of COD required to be collected and treated. The range of loading rates among the airports that EPA expects to deploy AFBR treatment as part of their winter stormwater management systems are provided the figure below.

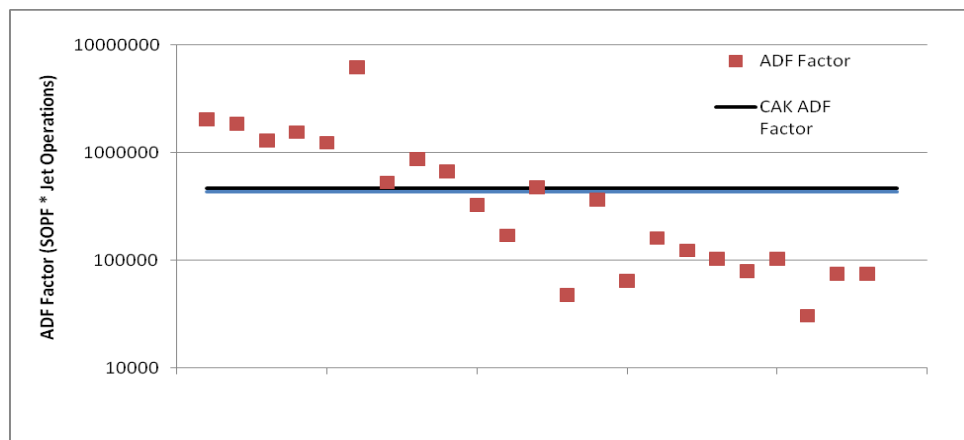


The design loading rates for the two model AFBR systems are represented by the two horizontal lines. In addition, the dotted lines indicate the maximum loading observed at ALB and the average loading based on one year's worth of data for CAK. The AFBR system currently under construction at PDX also falls within this narrow range of design daily loading conditions. This analysis indicates that AFBR systems for BOS, EWR, IAD and ORD would have a daily treatment capacity of 9-12 times greater than the model systems. Alternatively, at the lower end of loading rates, EPA assumes the following airports would install AFBR systems

which are less than 30% of the design capacity (850 lbs. COD/day) for the CAK system: OTZ, BHM, JNU, OME, BET, SAT and XNA. At low loading rates (<15-30% of the CAK system), design engineers will require pilot testing to facilitate vessel sizing. If pilot tests are not conducted, then design engineers are likely to size systems similar to existing facilities (CAK and ALB) thereby forcing system operators to store stormwater until a sufficient volume is collected to minimize multiple start/stop cycles. This operating strategy (storage of stormwater) will promote the degradation of stormwater within holding tanks and result in sub-standard performance.³⁰⁰

A comparison of the model AFBR airports to those airports potentially impacted by the Proposed Rule was also conducted to determine the extent of similarity between airports. This analysis was conducted by comparing the ADF Factor and is shown in the figure below. The ADF factor is defined as the product of jet departures and SOFP days.

Figure 2. ADF Factor versus Model Airport AFBR



The ADF factor provides an indication of the magnitude of deicing at each airport. In this analysis, the position of the AFBR model airports (ALB and CAK) demonstrates the limited experience base for the application of AFBR technology. These systems have not been implemented at either very large or very small ADF usage airports. Notable outlier with respect to the ADF Factor compared to ALB and CAK values are ORD and many of the smaller airports (*e.g.*, FWA, ROA, OKC, JNU, XNA, BHM).

These analyses suggest that the existing or planned AFBR systems at airports are representative of a relatively narrow design COD loading criteria (3,400 to 5,200 lbs. COD/day). The majority of airports in which EPA assumed would install AFBR systems fall outside of this narrow range.

In contrast, analysis of the two airports in which RO technologies have been applied (PIT and DFW) result in ADF factors of 1,912,700 and 805,828, respectively. ADF usage at both of these airports spans between 166,790 gallons PG/EG for DFW to 943,982 gallons PG/EG for PIT. Thus, this technology has been applied at a wide range of ADF usage airports (both Tier 1

³⁰⁰ Arendt T. and J. Prior, ACI-NA/ATA/RAA Deicing Management Conference, Akron-Canton Airport Deicer Management System North Canton, OH (July 8 2009).

and 2) representing very diverse deicing and weather conditions. Again, the point of this discussion is not to promote UF/RO technology as the model technology but to demonstrate that EPA was arbitrary in their selection of AFBR technology as the model technology. Clearly, AFBR technology is a demonstrated effective means of treatment, however, it has only been applied to a select and narrow range of airport deicing conditions. EPA should, but has not, explored the reasons for these historical technology selections.

D. EPA's Derivation of BAT Limitations for COD Is Arbitrary & Capricious

EPA utilized 10 years of monitoring data of effluent COD concentrations from the AFBR located at ALB to develop ADF Treatment Standards for COD. Specifically, using data from the two AFBR units at ALB, EPA determined that the 271 mg/L COD daily maximum represents the median of the 99th percentile of the daily values from each unit and 154 mg/L COD maximum weekly average represents the median performance of the 97th percentile of the weekly average performance of each unit.

However, the ADF Treatment Standard does not represent the performance of ALB's system. Nor does it represent the performance of the only other currently operating AFBR system, *i.e.*, at CAK. In addition, the ADF Treatment Standard does not fairly reflect the performance that can be expected from AFBRs deployed at the other airports EPA anticipates will need to install AFBR treatment systems – particularly at much larger and much smaller airports.

The following technical analysis describes four respects in which the data in the Record appear to call into question the effluent limitations EPA has extrapolated. The Agency must recompute its proposed ADF Treatment Standard to reflect these variables so that any final ELG contains effluent limitations that reasonably reflect the model technology's capacity to perform across the range of airports to which the Rule will apply.

1. Total COD vs. Soluble COD

EPA used 10 years of process monitoring data collected by ALB to evaluate and establish AFBR Treatment Standards of 271 mg/L (maximum daily discharge) and 154 mg/L (weekly average discharge). The data provided by ALB consists of daily grab samples of effluent³⁰¹ from both AFBR and analysis for soluble COD.³⁰² EPA was aware of this as indicated through a confirmation telephone call with ALB and other communications.³⁰³ EPA's proposal to establish limitations for COD is technically flawed in that EPA misrepresents the data by establishing a limit for COD instead of soluble COD, the analytical parameter measured by ALB.

³⁰¹ Document - 1134.

³⁰² Document - 1114 (data from each reactor clearly labeled "S COD").

³⁰³ Document - 0716 (in "the long term data . . . for the anaerobic system . . . Feed COD is total influent COD and ***the effluents are S COD, which is soluble COD***) (emphasis added); Document - 1131 (ALB data is "from 1999 - 2007 (many years worth of data) and is very straight forward with date, COD in (mg/L), ***soluble COD out (mg/L)***") (emphasis added).

The analytical methods for COD established in 40 CFR Part 136 do not differentiate between total and soluble COD. The data collected at ALB were not collected for compliance purposes but rather for process monitoring purposes. However, EPA failed to acknowledge the form of COD data collected at ALB.

EPA further confuses the issue through a comparison of data EPA collected for total COD during their sampling site visit with the data collected by ALB through their monitoring program.³⁰⁴ Specifically, the EPA samples consisted of 24-hour composites collected at the confluence of the two reactor effluents. These samples were analyzed for total COD. Although EPA did not utilize their sampling results in the calculation of the COD limits, EPA provides a comparison of the two sets of data. The data collected by EPA for total COD averaged 139 mg/L over the 5-day sampling period. In comparison, the ALB data for soluble COD averaged 68 mg/L over the same 5-day period, approximately 50% lower than the EPA results. While these data are not directly comparable due to differences in sampling periods (*i.e.*, 24-hour composite versus grab samples), the data indicate that there are significant differences between total and soluble COD concentrations.

Given that the data utilized by EPA to develop the limitations was for soluble COD, EPA must clarify the limitations and define the analyte as soluble COD. As noted above, the analytical method for COD does not provide guidance for the filtration of the sample prior to COD analysis. For other EPA methods in which the dissolved or soluble phase of the analyte is to be measured, EPA has defined “dissolved analyte” as the “concentration of analyte in aqueous phase that will pass through a 0.45 µm filter.”³⁰⁵ EPA should adopt this definition and define S COD (soluble COD) in the rule as that COD in aqueous phase that will pass through a 0.45 µm filter.

2. Failure to Address Adequately Sources of Variability

In developing the effluent limitations, EPA utilized 10 years of monitoring data from reactors R101 and R102 at ALB and analyzed each reactor independently. For the daily limit, EPA calculated the 99th percentile daily value for each reactor and established the median of the two results as the daily maximum discharge limitation. For the weekly limit, EPA used exactly the same procedure, but used the 97th percentile value. This approach fails to recognize and address adequately variability associated with the season and the individual reactor.

As noted above, EPA used 10 years of monitoring data to make these calculations. EPA acknowledges that this data “had substantial variability between years.”³⁰⁶ In addition, statistical analysis of the data indicated that “effluent data appear to have periods with relatively little daily variation *and periods with significant daily variation*,” and “suggest[s] that there is a statistical

³⁰⁴ TDD at 14-8, Table 14-1.

³⁰⁵ Method 200.7

³⁰⁶ Document - 1165 at 1.

relationship between the influent and effluent measurements.”³⁰⁷ Unfortunately, the analysis failed to consider the effect of influent COD loading on effluent concentration.

Specifically, AFBR systems are operated to maintain constant loads. Thus, while influent concentrations may vary, the operators attempt to hold influent loads relatively constant through the adjustment of flow. It therefore is not surprising that a statistically significant relationship between influent and effluent concentration was not identified. It is the relationship between influent *load* and effluent concentration that EPA should have been looking for. However, none of this was taken into account in the derivation of the proposed ADF Treatment Standard.

The ALB data, specifically data from seasons in which loading was the highest, makes it clear why the relationship between influent load and effluent concentration must be taken into account. Influent COD loads for the 2002 season were significantly higher than were loads for the other seasons. The average daily influent load for the 2002-2003 season was 47% higher than the average daily load for all seasons and the average load for the 2002-2003 season was 2.65 times higher than the lowest loading season (2006-2007). Calculation of the 99th percentile daily maximum concentration based on the 2002 season results in a limit of 362 mg/L as SCOD. This is a 33% increase above the proposed limitation.

Given this difference at ALB, the ADF Treatment Standard should be re-evaluated to account for the impact of severe winters and operational periods when the system was operated at or near system design capacity as defined by load. Certainly, deicing operations along the East Coast for the 2009/2010 deicing season will be substantially increased compared to previous deicing seasons, and these increased loads and increased influent concentrations might be expected to impact AFBR performance.

The variability in deicing and potential influent concentrations is also likely to occur within the same season at the same airport (*e.g.*, light freezing rain conditions versus light snow), between seasons (severe winters versus light winters) and between airports. The effect of winter severity on AFBR operations should be considered and the use of longer-term limitations (*e.g.*, weekly or monthly limitations as opposed to a daily maximum limit) should be evaluated. In the design of airport stormwater treatment systems, detailed information is gathered regarding weather intensity, storm event frequency and severity, and volume of impacted stormwater produced at an airport to allow integration of all system components (storage, equalization and treatment) and calculation of optimal system sizing. EPA’s limited analysis of data from a single

³⁰⁷ Document - 1155 (emphasis added). We note that this relationship was found to be insignificant after the removal of 140 outliers and data between reactors was combined. We also note that EPA’s consultant failed to derive a reliable model to predict the relationship between weather, departures and influent COD concentrations indicating that the failure resulted from the lack of a “moderately strong” statistical relationship. Document - 1155 at 11. The consultant’s failure to derive a reliable model based on COD influent concentration as well as their failure to consider the effect of influent load does not demonstrate no such relationship exists, especially in the face of data (*e.g.*, 2002-03) that indicates there is a strong relationship. Certainly, the failure to derive a model *for one airport* does not demonstrate that the relationship does not exist and cannot excuse the failure to take it into account.

airport AFBR system fails to recognize the effect of weather on system performance. Recognition of the effect of weather and type of collection technology employed on system design is critical in the establishment of limitations.

In addition, and as noted above, Albany utilizes two AFBR reactors for the treatment of stormwater impacted by deicing operations. Influent for each reactor is drawn from the same pond and the units are typically operated in parallel. However, derivation of the 99th percentile for the two reactors results in drastically different values (326 vs 216 mg/L). EPA dealt with this difference by taking the median value. However, the reasons for the differences are not known.

Although both reactors draw from the same influent pond and thus have similar, if not identical, influent concentrations, effluent concentrations for the two reactors are significantly different, with reactor R101 achieving a slightly lower average discharge concentration. Further, when only 2002 data are evaluated, reactor R101 is significantly higher in concentration than reactor R102. EPA attributes these differences to “slightly different influents, equipment and other factors.”³⁰⁸

By utilizing data from both reactors, however, EPA acknowledges that both reactors are being operated diligently. Thus, use of the mean 99th or 97th percentile value for the two reactors fails to acknowledge that diligent operation of an AFBR can result in 50% higher percentile value. The use of the median of the two 99th or 97th percentile values for the reactors at ALB to establish ADF Treatment Standards obscures the fact that the performance of the two reactors differ by 110 mg S COD/L (the difference between the 99th percentiles calculated for the ALB reactors). Since it is implied that both reactors are well-operated, it is the data from the less-well performing unit on which EPA should base its BAT limit.

3. CAK Performance vs. ALB Performance

Since the development of the draft ELG proposal, the only other example of an AFBR reactor designed to treat stormwater containing residual ADF has been placed into operation. This system is considered state of the art and although similar to ALB in terms of the load of COD treated per cubic foot of media, it is different from the ALB system in both the concentration of material treated (CAK average influent S COD concentration is 68,951 mg/L compared to the average ALB influent concentration of 5,620 mg/L COD) and the rate of treatment (average flow at ALB was 90 gpm compared to average flow at CAK of 4 gpm for both reactors combined). It is prudent to utilize the performance of this new unit to determine whether treatment efficiencies based on ALB data alone are supportable.

We have obtained data from the first year of operation of this system and utilized them to calculate the 99th percentile discharge SCOD concentration. These data result in the calculation of a 99th percentile concentrations of 402 and 255 mg/L SCOD with a median concentration of 328.5 mg SCOD/L.

Note that as part of this calculation, a significant amount of data collected during system start-up was eliminated because the system operation during those periods was characterized as “system upset.” Thus, the 99th percentile concentrations calculated above do not reflect start-up

³⁰⁸ TDD at 14-6.

conditions. Specifically, effluent start-up data from 11/1/08 to 12/14/08 were eliminated due to “system upset” conditions. During this period, the average effluent concentration was 1,215 mg/L S COD and ranged between 212 and 2,238 mg/L S COD. Had these data been included to represent start-up conditions, the percentile concentration (which forms the basis for establishing the daily maximum standard) would be a significantly higher value.

These data illustrate two concepts. First, the higher influent concentrations at CAK resulted in a higher effluent concentration. Second, there is significant variability between the two CAK reactors (although both received similar if not identical influents). The imposition of more restrictive limits on CAK (based on ALB performance) may require CAK to operate at a lower loading thereby increasing storage requirements (*e.g.*, to comply with the limit, the water must be treated at a lower rate). Put another way, using data from just one of two extant plants already puts the second plant, which EPA would likely agree is a state of the art AFBR, out of compliance. Further, because the root cause of the variability between reactors is not known (and apparently not controllable), the effluent limitation should be based on the higher of the two limitations.

4. Performance Degradation During Start-Up

EPA has recognized that AFBR reactors will be operated as semi-continuous batch treatment systems. The units will be placed into operation when a sufficient volume of stormwater has been collected to sustain operation of the reactor for a sufficient period of time. During system start up, effluent concentrations, as evidenced by the CAK start-up data, are likely to be higher and more variable as the bacteria acclimate to the influent compared to periods of continuous operation. Further, frequent changes in influent COD loading will result in increased effluent COD variability as the bacteria respond to changing conditions. Thus, continuous operations with limited variability will produce more stable effluent. Unfortunately, because influent concentrations and load are governed to a large extent by weather, the system operator has limited ability to respond to these changing conditions and can only adjust influent flow rate to minimize impacts on effluent quality. These limited system adjustments are further constrained by system design parameters (*i.e.*, hydraulic limitations).

To minimize frequent start/stop operations, an airport may elect to collect stormwater until sufficient quantities are available to provide for long run times. However, as observed at CAK, the degradation of ADF within the storage system can significantly increase the duration of start-up periods as well as effluent concentration and effluent variability.³⁰⁹ Both the model airport, ALB and CAK have sufficient deicing events (21.9 to 41 SOFP days) such that the AFBR system start-up can be limited to a single period. However, a number of airports which have less frequent deicing events are also assumed to install AFBR to treat collected stormwater. Thus, the airport operator is faced either with storing water for long periods until sufficient volume has been collected to provide for long run times (thereby risking issues associated with fluid degradation) or engaging in frequent start/stop operations with their associated increased

³⁰⁹ Arendt T. and J. Prior, ACI-NA/ATA/RAA Deicing Management Conference, Akron-Canton Airport Deicer Management System North Canton, OH (July 8 2009).

effluent variability.³¹⁰ Either mode of operation will result in higher effluent variability and will cause well-operated systems to exceed the proposed effluent limitations.

For the reasons stated above, ATA believes that the Agency must re-compute its proposed BAT effluent limitations for aircraft deicing discharges to reflect these variables so that any final ELG contains effluent limitations that reasonably reflect the model technology's capacity to perform across the range of airports to which the Rule will apply.

E. EPA's Derivation of BAT Limitations for Ammonia Is Not Supported by the Record

Derivation of the proposed ammonia limitation – which applies to runoff from all outfalls at an airport, including runways – is based on performance of AFBR. Unlike the proposed COD limitation for ADF-impacted runoff which is based on a relatively robust data set (albeit from only a single installation), the ammonia limitation is based on only five data points. Moreover, this data set does not include any data points representative of start-up conditions,³¹¹ even though EPA acknowledges that the evaluation of start-up data is necessary to properly characterize treatment performance in this industry.³¹² For these reasons, the proposed ammonia effluent limitations are not demonstrably achievable. This flaw is fatal whether they are denominated BAT limitations (in which case they do not meet the statutory standard) or are considered to be a non-BAT compliance alternative (in which case they are not supported by a competent record and are arbitrary and capricious under the APA).

VIII. EPA'S DESIGNATION OF NEW SOURCE PERFORMANCE STANDARDS IS NOT SUPPORTED BY THE RECORD

A. Construction of a New Runway at an Existing Airport and Should Not Be Considered a New Source under the Proposed Rule.

A new runway at an existing airport should not be defined as a new source under the Proposed Deicing ELG because new runways: (1) do not discharge ADF; (2) are not substantially independent from an existing airport; and (3) are highly integrated with existing operations at airports. In short, a new runway at an existing airport is not a "new source" under the CWA and existing EPA regulations for making new source determinations. Under the Proposed Rule, a "new source" includes "any new runway constructed at a Primary Airport, the

³¹⁰ Arend, T. and J. Prior, 2009.

³¹¹ Notice at 44,700 ("In contrast to the COD limitations, which are based on a mixture of start-up and steady state periods, the ammonia limitation is based upon data collected only during steady state operations. EPA requests additional data that reflect ammonia discharges during start-up operations.")

³¹² Notice at 44,697 ("Because start-up conditions reflect onetime operating conditions, EPA generally excludes such data in developing the limitations. In contrast, EPA expects airports to encounter start-up operations at the start of every deicing season because they probably will cease treatment operations during warmer months. Because this adjustment period will occur every year for the Airport Deicing Category, EPA is proposing to include start-up data in the data set used as the basis of the limitations.")

deicing operations associated with the departures on the new runway and the deicing of paved surfaces associated with the new runway.” § 449.2. Therefore, based on the definition in the Proposed Rule, a new runway would be subject to NSPS. However, defining a new runway as a new source is not legally supported and would result in significant costs with unworkable compliance requirements for airports. Rather than prescriptively defining the term “new source” to include a new runway at an existing airport, the Proposed Rule should allow for new source determinations to be made based on the existing laws, regulations and policy.

B. A Runway Is not a “Source” as Defined Under Clean Water Act Section 306 (33 U.S.C.A. § 1316)

Construction of a new runway at an existing airport cannot be considered a “new source” under the Proposed Deicing ELG because a runway is not within the definition of “source” under the CWA. The CWA defines “source” as “any building, structure, facility, or installation from which there is or may be the discharge of pollutants.” 33 U.S.C.A. § 1316(a)(3). While a runway is structure, there is no discharge of ADF from a runway, and therefore, a runway is not a “source” under the CWA.

As EPA recognizes in the Proposed Deicing ELG, aircraft deicing operations do not occur on runways, but rather at terminal gates, gate aprons, taxiways, or centralized deicing pads, among other locations. *See* 74 Fed. Reg. 46683. ADF is applied to aircraft to remove snow, ice and frost from aircraft surfaces. Most of ADF drains from the aircraft surfaces to the ground where the aircraft is deiced. Under certain conditions, a high-viscosity anti-icing fluid is then applied to the aircraft to provide protection against additional accumulation of snow and ice. The anti-icing fluid generally remains on the wing as a thin protective film and ultimately shears off during the departure of the aircraft. In any case, there is no discharge of deicing fluids from runways. To the extent that deicing fluid is not discharged to the surface where it is applied, it comes off the aircraft in imperceptible amounts that are widely dispersed.

Since aircraft deicing fluid is not discharged from runways, a runway is not a “source” under the CWA. Therefore, a new runway at an existing airport cannot be defined as a “new source” under the Proposed Deicing ELG.

C. New Runway at an Existing airport Is not a New Source Under the National Pollutant Discharge Elimination System Regulations and Should not Be Subject to New Source Performance Standards

Even if a runway was considered a “source” under the CWA, a new runway at an existing airport is not a “new source” under NPDES regulations and should not be subject to NSPS. According to the Proposed Deicing ELG, a new runway or other runway construction activity would be deemed to be a new source only if it meets all of the criteria in NPDES regulation 40 CFR §§ 122.2 and 122.29 for the definition of new source. 74 Fed. Reg. 44694. However, construction of a new runway does not meet the criteria set forth in the NPDES regulations. A new runway is not a new source based on the plain language of the regulations, nor is a new runway a new source based on the “substantially independent” test established by EPA in the preamble to the regulations.

1. Construction of a New Source at an Existing Airport Is Not Within the Definition of “New Source” under NPDES Regulations

Construction of a new runway at an existing airport is not within the definition of “new source” under NPDES regulations 40 CFR §§ 122.2 and 122.29. Consistent with CWA Section 306, a new source is defined under 40 CFR § 122.2 as “any building, structure, facility, or installation from which there is or may be a discharge of pollutants,” construction of which is commenced after promulgation of applicable NSPS. New source is defined further under 40 CFR § 122.29, criteria for new source determination, which states that:

Except as otherwise provided in an applicable new source performance standard, a source is a “new source” if it meets the definition in § 122.2 and:

- (i) it is constructed at a site at which no other source is located; or
- (ii) it totally replaces the process or production equipment that causes the discharge of pollutants at an existing source; or
- (iii) its processes are substantially independent of an existing source at the same site. In determining whether these processes are substantially independent, the Director shall consider such factors as the extent to which the new facility is integrated with the existing plant; and the extent to which the new facility is engaged in the same general type of activity as the existing source.

40 CFR § 122.29(b)(1). A new runway at an existing airport does not meet any of the three tests established in 40 CFR 122.29 for a new source. First, a new runway is constructed at an existing airport that is already a source and potentially subject to the requirements of the Proposed Deicing ELG. Therefore, a new runway is not constructed at a site at which no other sources are located and 40 CFR § 122.29(b)(1)(i) is not satisfied. Second, a new runway is an addition to an existing airport and does not totally replace the process or production equipment that causes the discharge of pollutants at an existing source. A new runway is integrated into the existing operations at an airport and aircraft using a new runway will be deiced in accordance with existing deicing practices. And, as discussed in Section I above, deicing operations do not occur on runways. Therefore, a new runway does not totally, or even partially, replace the process or production equipment that causes the discharge of pollutants at an existing source and 40 CFR § 122.29(1)(b)(ii) is not satisfied. Finally, a new runway is not substantially independent of an existing source at the same site. All new runways are highly integrated into the existing airports where they are constructed. Since EPA has provided detailed guidance for determining whether a source is substantially independent in the preamble to the final NPDES regulations, this issue is discussed in more detail in subsection B, below.

2. A New Runway at an Existing Airport Is Not “Substantially Independent” as defined and Addressed by EPA in the Preamble to the NPDES Regulations

A new runway is not substantially independent from an existing airport. According to the NPDES rule, a source shall be a new source if it is substantially independent from an existing source at the same site. In determining whether a source is substantially independent, the

Director must consider the extent to which a new facility is integrated with an existing source and the extent to which the new facility is engaged in the same general type of activity as the existing source. A new runway at an existing airport is both fully integrated into the existing operations at the airport and associated with the exact same type of discharge activity as the existing source. Based on an analysis of the two factors for the substantially independent test, a new runway is not substantially independent from an existing airport and therefore, not a new source.

In the preamble to the final rule, EPA provided background on the new source definition and provided guidance for conducting the substantially independent test. EPA noted that the distinction between existing sources and new sources is based on the concept that new facilities have the opportunity to install the best and most efficient production processes and wastewater treatment technologies. 40 Fed. Reg. 38043. With respect to the substantially independent test, EPA stated that “the substantially independent test was aimed at ascertaining whether an existing source which undertakes major construction that legitimately provides it with the opportunity to install the best and most efficient production processes and wastewater treatment technologies should be required to meet new source performance standards at the facility.” *Id.* Finally, EPA noted that the substantially independent test is not based on whether a new facility could operate substantially independent, but rather on whether a new facility actually will operate substantially independent from the existing source.

Based on both the plain text of the rule and the policy supporting the distinction between new and existing sources, a new runway at an existing airport should not be considered as a “new source”

a. New Runways Do Not Satisfy the Substantially Independent Test

First, new runways are fully integrated into existing airports from a general operations perspective and, more specifically, from a deicing operations perspective. A new runway may be constructed for a variety of reasons, including to improve safety during poor weather conditions, accommodate larger aircraft (though not necessarily increase capacity), or improve operational capability during adverse wind conditions. In all circumstances, a new runway is designed to be fully integrated with an existing airport. Taxiways associated with the new runway connect to airport gates and ramp areas, as well as other runways and taxiways. Once a new runway is constructed, aircraft arriving at an airport may be assigned by air traffic controllers to land on any runway at an airport (subject to length and size requirements) depending on airports conditions. Likewise, when ready for departure, an aircraft may be assigned by air traffic controllers to depart on any runway including the newly constructed runway. Given the integration of new runways into existing airports, it is not possible to know for certain whether an aircraft will depart from a particular runway and it is most efficient of all aircraft of a particular operator to be deiced consistently. Requiring the installation and operation of a deicing pad for operations at a new runway would likely result in duplicate costs and infrastructure and significant inefficiency due to inconsistency with existing deicing operational practices.

The second factor under the substantially independent test is whether a new facility is engaged in the same general type of activity as an existing source. As emphasized in Section I, deicing does not occur on a runway, and therefore, a runway is not a source. Nevertheless, a new runway is constructed for the same basic purpose as other existing runways at an airport: for the landing and taking off of aircraft. To the extent that aircraft are deiced during winter operations, all aircraft are generally deiced in a similar manner (with variations according to specific operator procedures), regardless of which runway that they ultimately depart. Therefore, a new runway and operations associated with a new runway are of the same general type of activity as already occur at the existing airport and existing runways.

Based on an application of the substantially independent test, a new runway at an existing airport is not a new source since a new runway is fully integrated into an existing airport and the new runway allows for the same general type of activity (*i.e.*, takeoffs and landings) as already conducted by the existing airport. In the Proposed Deicing ELG, EPA failed to conduct an assessment of a new runway under the substantially independent test, and instead, simply stated the belief, without providing any supporting analysis, that new runways are not significantly integrated into existing airport operations.

b. Defining a New Runway at an Existing Airport Is Not Consistent with EPA Policy for New Sources

Defining a new runway as a new source is also not consistent with EPA policy for new sources as established in the preamble to the final NPDES rule. One concept behind the regulation of new facilities as new sources subject to NSPS is that they have the opportunity to install the best and most efficient production processes and wastewater treatment technologies. Under this concept, construction of a new source allows for the opportunity to install new technology without incurring costly retrofits and/or duplication of existing technology. However, installation of a new runway at an existing airport does not fit within this concept since it does not provide an opportunity to install the best and most efficient processes and wastewater treatment technologies. The installation of infrastructure to support the 60% collection and associated treatment standard would require significant resources, expenditure, and construction activity, well beyond any construction associated with a new runway. As documented elsewhere in these comments, satisfying the 60% collection standard requires much more than constructing a concrete pad adjacent to a runway, but also requires installation of extensive piping, large storage capacity, and treatment, all of which must be installed in a manner that does not significantly disrupt operations at an active airport or pose a safety hazard.

Operationally, the most efficient approach is to integrate a runway with an existing airport and conduct deicing operations associated with a new runway in a manner consistent with the deicing operations for the entire airport. Defining a new runway as a new source would require installation of a deicing pad collection system and associated treatment to meet the NSPS. In addition to the administrative and operational challenges of trying to determine and keep track of when a particular aircraft might use the new runway for departure, requiring the installation of a pad for the new runway would likely require installation of duplicate infrastructure and purchasing and operation of additional deicing equipment to operate deicing operations associated with a new runway. In order to enable efficient and cost-effective deicing operations, an airport's deicing operations must be managed on an airport-wide basis.

Ultimately, construction of a new runway does not offer an opportunity to install the best and most efficient treatment technology.

D. An Increase in Capacity Is Not the Standard for Making a New Source Determination under EPA Regulations, and in Any Case, a New Runway at an Existing Airport Does Not Necessarily Result in a Capacity Increase

In the preamble to the Proposed Deicing ELG, EPA bases its decision to define a new runway as a new source, in part, on the belief that “few new airports will be constructed in the foreseeable future, and that most of the anticipated increase in airport capacity will be through expansion of existing airports.” *See* 74 Fed. Reg. 44694. Put another way, EPA has defined the term “new source” to include a new runway at an existing airport in order to address increased capacity through expansion of existing airports. Unfortunately, however, there are two significant flaws with EPA’s decision to use increased capacity as the basis for defining a new runway as a new source.

First, increased capacity is not the appropriate test for determining whether a construction activity results in a new source. As thoroughly detailed in Section II, above, the list of factors identified in 40 CFR 122.29 should be evaluated, including an application of the substantially independent test, in order to determine whether a construction activity results in a new source. Therefore, considering capacity alone is not sufficient to classify a construction activity as a new source.

Second, construction of a new runway at an existing airport does not necessarily result in increased capacity. While EPA evaluated the average costs of runway construction, *see* Section VIII(F), below, EPA did not evaluate the purpose of conducting new runway projects. In many instances, new runways are not intended to enhance capacity, but rather to provide greater safety margins. For example, a new runway may be constructed in a different angle than the existing runway and prevailing wind direction for use during crosswind conditions. In this situation, traffic would shift to the new runway during crosswind conditions, but overall capacity would not necessarily increase. Another example of a runway project that does not necessarily increase capacity is the construction of a longer runway that provides greater margins of safety and potentially provides access to new aircraft types. Ultimately, while there are a variety of general reasons for construction of a new runway, the actual reason for construction and purpose of a new runway is airport and project specific.

Since an increase in capacity is not the appropriate test for determining whether an activity will result in a new source and the purpose for new runway projects cannot be generalized, the definition of new source should not include a new runway at an existing airport and EPA should make new source determinations on a case-by-case basis according to existing regulations and policy.

E. Demonstration of Compliance for New Runways at Existing Airports Is Unworkable under the Proposed New Source Performance Standard

Under the NSPS in the Proposed Deicing ELG, all new sources must collect at least 60 percent of available ADF (Proposed § 449.11(a)). However, when the proposed NSPS is applied

to new runways at existing airports, it is not clear what volume of available ADF the 60% collection requirement applies to. Based on EPA's proposed definition of new source to include a new runway and "the deicing operations associated with the departures on the new runway," it appears that EPA believes that the 60% collection requirement applies to available ADF from deicing operations associated with the departures on the new runway. Proposed § 449.2. The superficial simplicity of EPA's proposed approach, however, is belied by the imprecision of the collection standard. The proposed standard would lead to significant obstacles in designing an adequate system to meet the NSPS and an inability to demonstrate compliance with the NSPS due to the integration of a new runway into existing airport operations.

1. The NSPS Does Not Provide an Adequate Basis for the Design of a Collection System for a New Runway that Will Assure Compliance with the Standard

During the design of a collection system for a new runway, a determination would need to be made regarding the appropriate size of the collection system to meet the NSPS. Unfortunately, however, the NSPS is not clear regarding whether the collection standard applies to actual departures from a new runway or average departures from the runway. If the requirement applies to all actual departures from the new runway, the maximum throughput of the collection system will determine the departure limit for the new runway during winter operations. From an operations perspective, a new runway may at times be relied upon to handle a majority or all of an airport's departures due to closure of another runway as a result of a disabled aircraft, weather, or a construction activity. Therefore, there may be times when an airport's departures shift to a new runway, but the average departures from the new runway are actually much lower over time. If the NSPS applies to actual departures, the collection system will have to be over-engineered and oversized in order to account for the infrequent circumstances when airport departures are shifted to the new runway. Designing a large enough collection system would be necessary to assuring compliance with the NSPS without artificially constraining the capacity and value of the new runway. However, designing and constructing a collection system that is much larger than needed on a typical basis will be very costly, potentially as costly or more so than construction of the new runway, and therefore decisions about new runway construction will be driven by the required size and cost of the deicing collection system required to meet NSPS.

2. Due to the Integration of a New Runway into Existing Airport Operations, Demonstrating Compliance with the NSPS Is Unworkable for a New Runway at an Existing Airport

The proposed NSPS is unworkable from a compliance demonstration perspective due to the integration of new runways into existing airport operations. Determination of the departure runway for a particular aircraft or time of day is governed by numerous factors, including but not limited to the weather, volume of traffic, destination and terminal/gate location. In addition, the designated departure runway is dynamic and can change at any time due to the aforementioned factors. It is not uncommon for an aircraft's departure runway to be assigned or reassigned after the aircraft leaves the gate. Therefore, an aircraft that is deiced at the gate with a 20% collection system may be subsequently assigned to depart from the new runway. The NSPS either prevents

the aircraft from departing the new runway because 60% of the ADF applied to the particular aircraft has not been collected, or presents a compliance challenge for determining how to account for the fact that the aircraft departed the new runway, but only met the 20% collection requirement. The proposed NSPS presents at best an unworkable scheme for compliance demonstration for new runways at existing airports, and potentially presents a significant operational limitation.

F. The Supporting Document Provided by EPA Is not Sufficient to Establish that a New Runway at an Existing Airport Should Be Defined as a New Source

EPA did not provide adequate documentation to support defining a new runway at an existing airport as a “new source,” and failed to consider the appropriate statutory and regulatory requirements. In fact, the only apparent supporting document in the docket for the rulemaking is a two-page memorandum making a significantly flawed comparison of the “average” cost of constructing a deicing pad to the “average” cost of constructing a new runway.³¹³ EPA’s support document is insufficient for several reasons. First, a comparison of the cost of a treatment technology to the cost of new construction is not the appropriate test for determining whether new construction at an existing source should be considered a “new source.” Instead, EPA should have analyzed the requirements specified by the CWA and NPDES regulation, including whether a new runway is substantially independent from an existing airport. Second, in making the cost comparison, EPA used a rough, flawed analysis that does not support the conclusion reached in the memorandum that deicing pads are generally less than 10% of the cost to design and construct a new runway. Finally, the costs of achieving the NSPS of 60% collection and treatment involve more than the cost of constructing a deicing pad.

1. EPA’s Supporting Document Does Not Address the Statutory and Regulatory Requirements for Determining Whether New Construction Should Be Considered a “New Source”

As identified in Section I and II of Part 2 these comments, in order to determine whether a construction activity results in a “new source,” it is necessary to first determine whether it is a “source” under the CWA, then, if so, determine whether it would be a “new source” under the NPDES regulation. In fact, in the preamble to the Proposed Deicing ELG, states that a new runway meets the terms of the NPDES regulation defining new source, but does not provide any analysis of that determination. Under the NPDES regulation, a new source must be: a) constructed at a location where no other sources exist; b) totally replace an existing source; or c) be substantially independent from an existing source. However, neither the preamble to the Proposed Deicing ELG nor the single support document provide any analysis under the three regulatory requirements for a new source. An appropriate analysis, as discussed in Sections I and II above, demonstrates that a new runway at an existing airport is not a new source and should not be subject to NSPS.

³¹³ See Comparison of Airport Deicing Pad Costs to New Runway Costs, Memorandum from Ms. Mary Willett to Mr. Brian D’Amico, October 23, 2008.

2. EPA's Single Support Document Contains a Flawed Analysis that Does Not Support the Conclusion Reached in the Document

EPA's single support document that compares average deicing pad costs to average new runway costs is not sufficient to demonstrate that new runways should be defined as new sources, and in any case, the document contains a flawed analysis that does not support the conclusion that the average deicing pad costs are generally less than 10% of the average runway costs.

a. Improper Calculation of Average Deicing Pad Cost

In order to arrive at an average deicing pad cost, EPA selected four airports: CAK, CCLE, PIT and MSP. As discussed thoroughly elsewhere in these comments, EPA derived single dollar amount deicing pad cost for each of the aforementioned airports. Making no distinction for the type, size, or number of deicing pads at each airport, EPA took the sum of the four single dollar values for each airport and divided by four in order to arrive at an average deicing pad cost of \$45,050,000. As noted, this metric does not take into account the type, size, or number of deicing pads at a particular airport, but instead is an artificial number that bears no relation to the actual cost of constructing a deicing pad and related infrastructure at an airport.

b. Improper Calculation of Average Runway Cost

In order to arrive at an average runway cost, EPA used information provided by five airports in response to a questionnaire: PHX, BOS, IAD, SEA, and ATL. The information provided included costs for design and construction, and in some cases project and construction management, legal and environmental costs, as well as land purchase costs. Costs ranged from \$47,500,000 at PHX to \$1,150,000,000 at ATL. Here too, EPA took the sum of the four single dollar values for each new runway and divided by five in order to arrive at an average new runway cost of \$490,740,000. Given the small sample of airports and the lack of uniformity of data (some airports provided legal and land purchase costs), the average new runway cost arrived at by EPA is not a reliable indicator of the actual runway cost at any particular airport.

c. The Conclusion Reached in the Support Document Is not Supported by the Weak Analysis

In order to compare the cost of constructing a deicing pad to the cost of constructing a runway, EPA compared the average deicing pad cost and average new runway cost that were derived based on the analyses discussed in subsections i and ii above. Based on this comparison, EPA determined that the average cost of deicing pad installation is less than 10% of the cost of an average new runway, and therefore, it is acceptable to categorize new runways as new sources under the Proposed Deicing ELG. As noted, the "average deicing pad cost" and "average new runway cost" are fanciful numbers that are based on limited and inconsistent data. Comparing the two numbers is not a reliable or accurate method for determining the likely additional costs of constructing an ADF fluid collection and treatment system when constructing a new runway.

3. The EPA Support Document Only Address the Costs of Constructing a Deicing Pad, but Does Not Address Total Costs Associated with Meeting New Source Performance Standard 60% Collection and Treatment Requirement

The EPA Support Document assumes that the only cost associated with meeting NSPS would be construction of a deicing pad. However, this assumption does not take into account the infrastructure that is necessary to collect and store fluid, as well as the additional treatment capacity required in order to achieve 60% collection and treatment. Further still, the EPA support document does not take into account the added costs associated with constructing, operating and maintaining a separate deicing collection and treatment system for a new runway. Depending on existing deicing infrastructure and operations at an airport, NSPS requirements may be inconsistent and require a duplication of resources and equipment.

G. The Proposed ELG Should Not Specifically Define New Source to Include a New Runway at an Existing Airport, but Instead Should Refer to the Existing Criteria Established under CWA and EPA Regulations for Making New Source Determinations

In the preamble to the Proposed Deicing ELG, EPA states its intention to specify that a new runway is a new source. 74 Fed. Reg. 44694. EPA states the belief that, in general, new runways are not significantly integrated with existing airport facilities in a way that should prevent them from being new sources. *Id.* As a caveat, EPA notes further in the preamble that a “new runway or other runway construction activity would be deemed to be a new source only if it meets all of the criteria” in existing EPA regulations at 40 C.F.R. §§ 122.2 and 122.29. However, the language of the Proposed Deicing ELG contains no such caveat. The Proposed Deicing ELG defines a new runway at a Primary Airport as a new source under all circumstances. As the preceding discussion and analysis in Sections I to V above make clear, new runways at existing airports do not satisfy the established criteria under existing EPA regulations for new source determinations. Instead of specifically defining new source to include a new runway at an existing airport, the Proposed Deicing ELG should refer to existing EPA regulations 40 CFR §§ 122.2 and 122.29 for making new source determinations. While ATA believes that there are few, if any, conceivable situations where a new runway at an existing airport would satisfy the criteria for new source determination, relying on existing regulations would be consistent with past EPA practice and would allow for an evaluation of the characteristics and factors for which a specific runway project is being carried out.

IX. EPA’S ESTIMATES OF ADF USAGE (BOTH NATIONAL AND AIRPORT SPECIFIC) ARE INACCURATE BY A LARGE MARGIN AND UNDERMINE THE INTEGRITY OF THE ENTIRE RULEMAKING

EPA’s analysis of ADF usage is another lynchpin in its Proposed Rule. Stated most bluntly, the viability of the entire proposal depends on the reasonableness of its estimates of ADF usage. Most directly, the justification for the Proposed Rule (that it is both “economically

achievable” and “achieves the greatest levels of pollutant removals”³¹⁴) rests on the accuracy of its ADF usage estimates. The Agency’s assessment of “pollutant removals” achieved cannot be accurate unless the usage estimates that determine baseline loads are accurate. So too, ADF usage determines the BAT for ADF collection applicable to a particular airport – thus determining the costs imposed on specific airports and, in turn, whether the Proposed Rule is “economically achievable.” The centrality of its ADF usage estimates to its entire analysis is apparent in EPA’s reliance on an ADF usage threshold (460,000 gallons) to differentiate between airports subject to the 60% ADF collection requirement and those subject to the 20% ADF collection requirement.

As explained below, EPA’s estimates of ADF usage are inaccurate by very large margins.

EPA developed a pollutant loading estimation methodology that utilized aircraft deicing fluid purchase information provided by airline personnel in the Airline Deicing Questionnaire. EPA used this data to estimate ADF usage at 56 airports. EPA notes that in some cases, data were not available for every airline operating at an airport, thus, EPA extrapolated the amount of ADF used by the reporting airlines to estimate the total amount of ADF applied at the airport³¹⁵. EPA states that “this was done based on the number of airport operations (departures) at the reporting airlines and the total amount of airport operations.” Estimated total airport ADF usage for the 56 airports is provided in Document-1107, Table 1, TDD, Table 10-2.³¹⁶

Using the estimated airport PG/EG gallons per year, EPA developed a relationship between PG/EG application and climate/size of the airport. Specifically, a regression was developed between PG/EG gallons for each of the 56 airports and the ADF factor (defined as the product of the average number of SOFP days and annual departures). Due to differences between continental U.S. and Alaskan airports, two regressions were developed. These relationships were then utilized to estimate ADF loading for all airports.

Review of the methodology utilized by EPA to develop estimates of ADF usage at all airports indicates that the methodology to extrapolate from ADF purchased by a limited group of air carriers at a specific airport to usage for the entire airport is not described and cannot be duplicated. Moreover, the estimated PG/EG gallons per year for the 56 airports is flawed by a significant but unknown amount.

A. EPA Estimates Could Not Be Duplicated

To evaluate ADF usage estimates, ATA collected ADF purchase information from member carriers for the 2002/2003 deicing season to the present and independently developed usage estimates for select airports. These data were utilized to evaluate EPA estimates of ADF usage. Sources of this information include the following:

- Completed airline deicing questionnaires from ATA members;

³¹⁴ Notice at 44692, col. 2.

³¹⁵ Document -1107.

³¹⁶ EPA consistently refers to “ADF use” but then presents the data as “PG/EG Gallons per Year”; we assume that “ADF use” is expressed in terms of PG (propylene glycol) and EG (ethylene glycol) volume.

- Data provided in the EPA database;³¹⁷
- ADF usage data compiled by select airports; and
- Flight/departure information from BTS T-100 database.

For the 2002 to 2005 deicing seasons, ATA utilized data from member carriers to estimate usage at both Washington Dulles (IAD) and Boston Logan (BOS) airports. For the 2006 to the 2009 deicing seasons, ATA utilized ADF usage data³¹⁸ reported by member carriers at select airports to determine the volume of ADF usage for those years. The conclusions of this analysis are that the Estimated PG/EG gallons per Year based on the Airline Questionnaire Responses could not be duplicated and the EPA estimates are not representative of recent ADF usage for a majority of the top 20 ADF usage airports.

1. Evaluation of 2002 to 2005 Season Estimates

ATA utilized data gathered from member carriers and estimated total airport PG/EG loads for IAD and BOS airports. These airports were selected because ATA carriers conduct the majority of the operations at those airports.³¹⁹

The estimated total airport PG/EG volume was calculated for each airport as the quotient of the reported PG/EG volume and the percent jet operations by the surveyed carriers during the deicing season. The results of this analysis for both airports are provided below:

Washington Dulles International Airport (IAD)			
Deicing Season	Reported PG/EG Volume	Percent Jet Operations by Surveyed Carriers	Estimated Total Airport PG/EG Volume
2002/2003	234,262	53.2	440,473
2003/2004	290,675	53.5	543,752
2004/2005	133,931	54.8	244,254
Average			409,493

Boston Logan (BOS)

³¹⁷ Document -1091.

³¹⁸ For some carriers, only purchase information was available. In these cases, purchase records were used.

³¹⁹ It must be carefully noted that ATA's estimates are just that – *estimates* – only, based on the ADF purchase information reported to EPA. ATA estimates are expressly *not* intended as definitive statements of usage levels at particular airports, but only as benchmarks against which to compare EPA estimates derived using the same type of data for the purpose of determining the validity/accuracy of EPA's reported estimates.

Deicing Season	Reported PG/EG Volume	Percent Jet Operations by Surveyed Carriers	Estimated Total Airport PG/EG Volume
2002/2003	542,772	82.5	657,626
2003/2004	327,050	85.6	381,387
2004/2005	569,407	88.2	645,277
Average			561,626

For IAD, average PG/EG volume for the total airport is estimated as 409,493 gallons. Using the same data, EPA's estimated PG/EG gallons per year for IAD was 1,076,083 gallons -- 2.5 times greater than the value calculated above.

For BOS, average PG/EG volume for the total airport is estimated as 561,626 gallons. Using the same data, EPA's estimated PG/EG gallons per year for BOS was 995,249 gallons -- nearly 2 times greater than the value calculated above.

Based on these two airports, it appears that EPA's estimates of ADF usage overestimate airport usage by a factor of between 2 and 2.5.

2. Determination of Representativeness of EPA Usage Estimates

To determine if the data EPA utilized from air carrier surveys conducted in 2007 is representative of current operations, ATA estimated PG/EG usage for the deicing seasons 2005/6, 2006/7, 2007/8 and 2008/9. Data on ADF usage or purchased volumes was provided by ATA carriers for the airports identified as the top 20 usage airports by EPA.

These data indicate the following:

- At these airports, ATA carriers typically represent the majority (> 50%) of jet operations. There were only two airports (PIT and STL) for which data from ATA carriers represented less than 50% of jet operations. Thus, for a majority of the airports, the data was considered sufficient to predict total airport ADF application.
- The relative percent difference between the EPA usage estimates and the average usage for these top 20 airports based on the ATA analysis was calculated. The ATA and EPA estimates were within +/- 15% of each other for only five of the 20 airports (DTW, EWR, IND, MSP and PIT). EPA estimates appear to be acceptable for these airports. For the other 15 airports examined, EPA and ATA estimates diverge by more +/-15% - this divergence ranges from 15.5% to 130%. This divergence is 50% or more at half of the airports. In short, there are substantial differences between EPA's 2002 to 2005 and ATA's current estimate of ADF usage.
- For 13 airports (a large majority of the top 20 airports), EPA ADF usage values are higher than the current usage values calculated based on ATA carrier usage or purchase information.

- EPA's estimates are less than ATA estimates only two airports, ANC and ORD. In the case of ANC, the estimates diverge substantially.

Based on the analysis of usage estimates at BOS and IAD and on comparisons of usage estimates developed by EPA with estimates of usage for recent years for the top 20 usage airports, EPA's usage estimates are demonstrably flawed and not representative of current ADF usage and potential loadings to the environment.

B. EPA Estimates Are Inconsistent with Readily Available Airport Usage Data

ATA also compared the EPA estimates to an independent data source: ADF usage publicly reported by airports. These comparisons consistently indicate that EPA's usage estimates are not representative of historic or current ADF usage.

1. ADF Usage at Boston Logan

The EPA average ADF usage estimate, ATA estimates and airport reported usage volumes are summarized below. Based on both ATA estimates and airport records, the EPA estimate of ADF usage at BOS overestimates usage by approximately a factor of 2. The data also indicate that ATA estimates of airport-wide ADF usage more accurately reflects airport records.

	Volume of PG/EG Applied at BOS by Season		
Season	EPA Estimate	ATA Estimate	Airport Records ³²⁰
2002/3	995,249	657,626	
2003/4		381,387	273,791
2004/5		645,277	463,019
2005/6		439,067	
2006/7		377,040	
2007/8		719,570	541,174
2008/9		863,167	850,524
Average		583,305	532,127

2. ADF Usage at Washington Dulles International Airport

Data from airport deicing records, ATA estimates of ADF usage and the EPA estimated use are summarized below and indicate that the assumed EPA application rate overestimates the application rates by a factor of between 3-4.³²¹ These data also indicate that the ATA estimates closely reflect actual airport-wide ADF application.

	Volume of PG/EG Applied at IAD by Season
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³²⁰ Data collected from Phase I study (CDM 2008).

³²¹ The Fairfax County Water Authority has submitted comments indicating that it believes EPA has overestimated ADF usage at IAD by a factor of 3. Document - 1199 at 4.

Season	EPA Estimate	ATA Estimate	Airport Records ³²²
2002/3	1,076,083	440,473	437,974
2003/4		543,752	332,953
2004/5		244,254	235,253
2005/6			114,068
2006/7		199,428	219,151
2007/8		304,794	211,641
2008/9		181,415	
Average		319,019	258,507

3. ADF Usage at Other Selected Airports

Data collected from other airports similarly indicates that the EPA estimate of Airport-wide ADF usage overestimates documented usage information based on airport records. These data are summarized as follows:

Volume of PG/EG Applied at Each Airport by Season						
Season	TR Greene ³²³		Port of Portland ³²⁴		Reagan National ³²⁵	
	EPA	Airport	EPA	Airport	EPA	Airport
2002/3	150,074	110,500	112,046	10,220	219,533	107,839
2003/4		77,057		59,362		88,268
2004/5		147,636		34,912		73,865
Average		111,731		34,831		89,991

Based on the information provided above, the ADF usage estimates provided by EPA and which serve as a basis for the cost-benefit analysis are flawed and overestimate actual usage by a significant and variable amount. Thus, the basis for determining the cost of the rule as well as its actual benefits are largely unknown and are not reflective of actual conditions.

C. Airfield Deicing Loads

EPA assumes that 100% of the urea applied is discharged to the environment. As a result, the Agency credits the Proposed Rule with the elimination of 100% of the COD associated with urea as applied. This represents an overestimation of the Proposed Rule's environmental benefits because some fraction of applied urea is never discharged to surface

³²² Metropolitan Washington Airports Authority, *Statement of Work for Aircraft Deicing Fluid Recovery, Disposal, and Recycling Management Services for Washington Dulles International Airport and Ronald Reagan Washington National Airport*, May 2009.

³²³ Data collected from End of Season reports.

³²⁴ Gresham Smith and Partners, *Data Collected from Draft Model Calibration Report*, 2008.

³²⁵ Metropolitan Washington Airports Authority, *Statement of Work for Aircraft Deicing Fluid Recovery, Disposal, and Recycling Management Services for Washington Dulles International Airport and Ronald Reagan Washington National Airport*, May 2009.

waters but decomposes in other media not under the auspices of the CWA. EPA must account for this “fugitive” ammonia and deduct it from the total amount of urea applied before calculating the pollution elimination benefits attributable to the Proposed Rule’s product substitution standard.

X. EPA’S ANALYSIS OF ENVIRONMENTAL BENEFITS IS FLAWED

As outlined above, key building blocks for this analysis (*e.g.*, waste loads, effectiveness of technologies, derivation of effluent limits) are each flawed, leading to inaccurate assessment.

Moreover, EPA appears to “double count” removal of COD and nitrogen related to substitution of urea and does not appear to add in the nitrogen created by the operation of its selected model ADF treatment technology. These defects must be eliminated in order to perform an accurate assessment of the Proposed Rule’s environmental benefits.

In addition, EPA’s selection of COD as the pollutant of concern results in overestimation of benefits. Because the Agency concludes that “[t]he average COD/BOD₅ ratio was 1.67,”³²⁶ it appears that its choice of COD over BOD results in an overestimation of environmental benefits related to ADF removal that is an additional 67% too high.

Finally, the benefits allocated to the reduction in ADF discharges and to PDF discharges must be computed and applied separately. Unlike most ELGs, the Proposed Rule contains a bright line between its model technologies for the control of ADF and those for PDF. Because these technologies are not mutually dependent, the costs of each technology must be assessed against the backdrop solely of that technology’s environmental benefits. Allowing ADF treatment costs to be justified on the back of large and far cheaper pollutant reductions (in terms of costs/pound of pollutants removed, not absolute costs) resulting from the proposed effective ban on urea is an evasion that the statute does not allow. EPA must evaluate the benefits and the costs of each model technology on its own merits, and not in the apples-and-oranges aggregate currently employed.

XI. EPA’S ECONOMIC ANALYSIS IS ARBITRARY & CAPRICIOUS

Before discussing EPA’s economic analysis and the invalidity of its determination that the Proposed Rule is “economically achievable,” we must be clear as to our understanding of how the various analyses EPA conducted to evaluate impacts to the industry relate to that determination. This is necessary because EPA does not identify with precision the ultimate basis for its determination that the Proposed Rule is “economically achievable.”

EPA does clearly identify two analyses performed to evaluate impacts on airports and two to evaluate impacts on airlines. To analyze impacts on airports, EPA: (a) used the so-called “revenue test” to “compare[] airport revenues with annualized compliance costs,” [the Airport Revenue Test]; and (b) “examined the impact of additional debt on each airport’s debt service

³²⁶ TDD at 10-19.

coverage ratio [Airport DSCR Test].”³²⁷ EPA explains that it assessed the economic impacts on airlines by:

- Comparing compliance costs to operating revenues (Airline Sales Test);
- Comparing compliance costs with operating profit and net income for airlines with positive earnings; and
- Analyzing the costs relative to unit measures of costs and capacity such as cost per available seat-mile (ASM),³²⁸ [EPA refers to this analysis in the EA as a “Market Impacts” analysis].³²⁹

Of these, the only one EPA unequivocally identifies as forming the basis of its determination that the Proposed Rule is “economically achievable” is the Airport Revenue Test. In both the Notice and EA, EPA explains its determination that “Option 3” (the selected package of BAT for the industry) is economically achievable solely in terms of results of this test.³³⁰ With respect to the Airport DSCR Test, EPA says only that the observed impacts “are significant enough to change our proposed findings on which BAT options are economically achievable.”³³¹ With respect to results of the Airline Sales Test and Airline Market Impact Test, EPA also says that it “does not believe that these impacts are significant enough to change our findings on which BAT options are economically achievable.”³³² In the Notice, EPA enumerates only the results of the Airline Sales Test before presenting this conclusion and says in the EA that it “based its evaluation of impacts on operating revenues” and that it “is not basing its determination of economic achievability on [the operating profits and net income] analysis.”³³³

Ultimately, based on EPA’s articulation of the basis for the determination, we conclude that its determination that the Proposed Rule is economically achievable is based on the results of the Airport Revenue Test, Airport DSCR Test, Airline Sales Test and Airline Market Impacts Test.

³²⁷ Notice at 44703, col. 1.

³²⁸ Notice at 44708, col. 2.

³²⁹ EA §5.4.

³³⁰ Notice at 44704-05, EA § 5.5.

³³¹ Notice at 44707, col. 1.

³³² Notice at 44708, cols. 2-3.

³³³ Notice at 44708, cols. 2-3, EA at 3-11, 3-12.

A. EPA’s Economic Analysis Is Arbitrary and Capricious Because the Economic Data It Relies Upon Does Not Provide a Reasonable Basis for Determining the Issue

1. EPA’s Analyses Undergirding Its Economic Achievability Determination Are Based on Extremely Limited Data That Are Not Reasonably Representative of Economic Conditions in the Industry

Of the analyses EPA relies upon to make its economic achievability determination, three of them – the Airport Revenue Test, Airport DSCR Test and Airline Market Impacts Test – are based on a single year, 2006. And, while the Airline Sales Test is based on three years, 2004-2006, when EPA applies the Sales Test to airlines with profits and/or positive net income it bases its analysis on just one year of data: 2006.³³⁴

As EPA itself notes, “2006 represents the first profitable year for the airline industry since 2000.”³³⁵ In fact, 2006 and 2007 have been the only profitable years for the industry since 2000, with 2006 by far the better of those years. EPA appears to justify its choice of 2006 for this analysis, stating “2004 and 2005 appeared to be abnormally poor financial years for the industry, while the financial data for 2006 seemed more representative of what might reasonably be expected in the future.”³³⁶ A more comprehensive, multi-year analysis of airlines’ global return on invested capital versus their weighted average cost of capital incurred shows there is not a single year since 1993 in which the industry covered its cost of capital.³³⁷

³³⁴ See EA at 5-19.

³³⁵ EA at 2-33.

³³⁶ EA at 5-15.

³³⁷ 1993-2004 from McKinsey study; 2005-2010F from IATA data/forecasts of global net income and estimates of invested capital.

	<u>Return (ROIC)</u>	<u>Cost (WACC)</u>
93	4.4	8.2
94	5.3	9.4
95	6.2	8.9
96	6.4	8.7
97	6.5	8.7
98	6.0	7.6
99	5.2	7.9
00	5.1	8.3
01	0.7	7.3
02	1.6	6.9
03	2.3	6.3
04	2.9	6.6
05	2.8	6.6
06	4.4	7.1
07	4.5	6.8

However, EPA understands that “[h]istorically, air transportation industry profitability has been highly cyclical,” and that since deregulation, “profits have become increasingly cyclical.”³³⁸ That is an understatement: over the past nine years U.S. airlines have recorded approximately \$60 billion in net losses.³³⁹

It is not possible for a single year – or even three years – to be representative of the industry. Indeed, EPA acknowledges that “the dramatic increase in fuel costs in 2008 has once again worsened the overall financial picture for the industry.”³⁴⁰ Since that time, with the global economic downturn and severe drop off in demand for air transportation, the financial condition of the industry has deteriorated. As a result, historical analysis of economic conditions in the airline industry certainly does not reflect present conditions in the industry. Economic conditions in the near-term future can be reasonably anticipated, subject of course to significant uncertainties. Even given these significant uncertainties, near-term economic conditions are, at least, more reasonably reflective of economic conditions the industry is likely to face in the compliance period than the 2004-2006 “snapshot” of industry conditions.

2. Economic Data on the Industry Is Readily Available So There Is No Practical Bar to EPA Using Data that Reasonably Reflects Industry Conditions

Historic economic data on the airline industry are widely available and EPA could easily discount compliance costs for any year in the past. Therefore, there is no practical reason for EPA to have limited its analysis to such a narrow window.

EPA must make at least a reasonable effort to estimate impacts on the industry during the compliance period – its failure to do so renders its determination of “Economic Achievability” legally insupportable. Certainly, there is nothing in the Record that takes account of the recent dramatic downturn in the economy or that supports the contention that the selected time periods are reflective of conditions that will prevail in the industry during the compliance period

B. EPA Has Failed to Analyze Broader Economic Impacts, Rendering Its Analysis Legally Insupportable

In addition to its obligation to determine “economic achievability” pursuant to the CWA, EPA is under an independent obligation flowing from EO 12866 and/or its own guidance to analyze broader impacts. It fails to do so. For example, regardless of its assumptions regarding pass-through of costs from airlines to customers, EPA concedes it is clear that “[i]n the long run, however, airlines must cover the costs to remain in operation, and will adjust capacity to meet

08	1.3	9.0
09F	1.5	12.0
10F	2.2	8.0

³³⁸ EA at 2-12, 2-14.

³³⁹ DOT Form 41 filings.

³⁴⁰ EA at 5-15.

demand.”³⁴¹ Here, the implication is that in the long run, the cost to airlines is zero because they “cover all costs.” The cost, however, is in the form of lowered capacity (supply) and lower demand. Elsewhere, in discussing the effect of PFCs (a charge added directly to the ticket price) EPA recognizes that, even if the cost is passed through directly to the passenger, the airlines bear the cost “indirectly through their impact on demand for air transportation services.”³⁴² While the effect on airlines may be measured in terms of operating revenues, that effect – as noted below – is a function of the price elasticity of demand. In any event, however, reduced supply and demand reflect very real costs to consumers in the form of higher fares or reduced service levels (manifested either as reduced frequencies in some markets and elimination of service in others). This will, in turn, have broader effects on the economy.

C. EPA’s Cost Estimates Do Not Provide Sufficient Basis for Supporting the Determination of “Economic Achievability”

As discussed at length in Section VI, above, EPA’s cost estimates are inaccurate. The Agency therefore has no reasonable basis upon which to base any economic analysis. Because it is based on highly inaccurate cost estimates, the Agency’s determination that the Proposed Rule is economically achievable – regardless of the test used to make the determination – is not supported by rational analysis.

D. EPA’s Analysis of Airline Impacts and the Conclusion that the Proposed Rule Is Economically Achievable for Airlines Is Legally Insupportable

1. EPA Must Evaluate the Economic Impact of the Proposed Rule on Airlines

EPA states that it has “chosen” to evaluate the impacts of the proposed regulation on air carriers in addition to airports.³⁴³ The Proposed Rule imposes direct and indirect economic impacts on airlines and economic analysis of these impacts is not a matter of choice, but required. EPA must evaluate the economic impacts of the Proposed Rule on airlines and, if it finds the Proposed Rule is not “economically achievable” for airlines, it is not legally sustainable.

a. Airlines Hold Permits Governing Discharges from Deicing Operations

EPA mistakenly characterizes impacts to airlines as “secondary,” stating that an “airport is typically the holder of the NDPES permit and thus responsible for collection and treatment of ADF-contaminated stormwater,” while “air carriers that use the airport are occasionally co-permittees, but never the principal permittee at the airport.”³⁴⁴

³⁴¹ EA at 2-48.

³⁴² EA at 3-9.

³⁴³ Notice at 44708, col. 2.

³⁴⁴ Notice at 44708, col. 2.

This characterization of impacts to airlines as “secondary” is incorrect for at least two reasons. First, airlines hold NPDES permits governing discharges from deicing activities. Airlines are not just “occasionally co-permittees” at airports that they serve. EPA and delegated states have provided the MSGP (which has been available since 1995 and is now in its second reissuance) under Section S of which airports and airlines may obtain permit coverage. Airlines have frequently obtained coverage under this permit, as recorded in EPA’s Permit Compliance System and other EPA databases (which we hereby request be included as a part of the administrative record for this rulemaking). In addition to coverage under the MSGP, airlines also are often co-permittees with airports they serve under individual permits. The Agency can identify these cases by reference to its own databases and communications with delegated state permitting agencies. In addition, airlines do hold individual NPDES permits governing deicing activities wholly separate from those held by the airport.³⁴⁵ In short, contrary to EPA’s assertion, airlines frequently are permitted separately from the airport under a general permit, are co-permitted with an airport under an individual permit, or permitted under NPDES permits entirely separate from the permit held by the airport. The suggestion that the permitting of airlines in this industry is anomalous is simply incorrect.

Second, the term “principal permittee” has no meaning under the CWA or EPA’s NPDES permitting regulations. Indeed EPA explains that “compliance with environmental regulations may be shared between airlines and airports as co-permittees.”³⁴⁶ The MSGP, for example, makes no mention of a distribution of responsibilities based on whether a permit holder is an airport or an airline. Moreover, while the terms of individual permits vary, we are aware of individual permits that impose overall planning and analysis obligations on both the airport and the airlines that serve it. Certainly that is the case where an airline holds an individual permit that addresses airline-specific outfalls and that is entirely separate from the permit held by the airport. In any event, obligations imposed by permits held by airlines are no less enforceable against co-permittee airlines than they are against the airport permittees. Airlines and airports are both named permittees for deicing discharge and EPA must consider economic impacts to both.

b. EPA Must Assess the Economic Impact on Airlines Because They Bear the Compliance Costs

i. EPA Practice and Policy Is to Assess the Economic Impacts of Regulations Applicable to Government Entities on the Community that Pays the Compliance Costs

In prior ELGs and guidance, EPA has affirmed that, where a regulation applies directly to a governmental entity, it must assess the economic impact on the community that will pay for the

³⁴⁵ For example, FedEx holds an individual permit at MEM.

³⁴⁶ EA at 2-1.

compliance costs. In its *Economic Analysis of Final Effluent Limitations Guidelines and Standards for the Landfills Point Source Category*,³⁴⁷ EPA affirmed:

The appropriate test for each facility depends on the type of facility in question. The facility impact analysis distinguishes between two types of non-hazardous waste landfills depending on ownership: privately-owned and municipally-owned landfills.³⁴⁸

The impact analysis subjected municipally-owned landfills to two impacts tests based on median household income . . . Median household income is an appropriate measure of scale against which to compare compliance costs. The costs incurred by municipally-owned landfills . . . fall primarily upon the landfills' household customers. . . . Therefore, this facility impact analysis uses the ratio of compliance costs to household income to estimate the impact on . . . each municipality that owns a landfill.³⁴⁹

In its most recent *Guidelines for Preparing Economic Analyses*, EPA states explicitly that in assessing the impact of regulations “when government entities are involved, the ultimate measure is ***the ability of its citizens to pay*** for the requirements.”³⁵⁰ Thus, where an ELG impacts a government entity the purpose of an economic analysis is not to assess the ability of government entities to pay for compliance costs. This is because governments have the authority to levy taxes and fees to cover regulatory compliance costs and it is, therefore, necessary to assess the economic impacts on the community that bears those costs.³⁵¹ The purpose of the analysis is to assess the impact on those that will pay the increased taxes or fees, which in this

³⁴⁷ EPA, Office of Water, EPA-821-B-99-005 (November 1999) (hereinafter “*EA for Landfills ELG*”).

³⁴⁸ *EA for Landfills ELG* at 4-2.

³⁴⁹ *EA for Landfills ELG* at 4-10. In fact, EPA concluded comparing costs to household income was appropriate here even though 20% of wastes handled by the landfills were generated by industrial, not household sources (*i.e.*, even though households did not bear all costs).

³⁵⁰ Document - 0623 at 156 (emphasis added).

³⁵¹ EPA Office of Water, EPA-823-B-95-002 at 2-1, (March 1995) (hereinafter “*Interim WQS Economic Guidance*”).

Governments have the authority to levy taxes and distribute pollution control costs among households and businesses according to the tax base. Similarly, sewage authorities charge for services, and thus can recover pollution control costs through users fees. In both cases, a substantial impact will usually affect the wider community. Whether or not the community faces substantial impacts depends on both the cost of the pollution control and the general financial and economic health of the community. If the public entity passes a significant portion of the pollution control costs along to private facilities or firms, then the review procedures outlined in Chapter 3 of this workbook should also be consulted to determine the impact on the private entities.

rulemaking – as EPA acknowledges – are the airlines.³⁵² Stated differently, the community that will pay for the compliance costs incurred by an airport as a result of this rulemaking is the community of airlines at the airport. Indeed, EPA affirms that where costs imposed on government entities are borne by “users . . . this needs to be taken into account” and if “some of the costs are borne by local firms, then that portion of the costs needs to be handled separately.”³⁵³

ii. **EPA Affirms that the Compliance Costs Imposed Under the Proposed Rule Are Borne by Airlines**

EPA repeatedly acknowledges that, as a practical matter, the compliance costs imposed by the Proposed Regulation would be borne by airlines. “In the long run, air carriers (and their passengers) pay for much of the airport’s infrastructure and operating expenses.”³⁵⁴ In the EA, EPA observes:

In summary, the impression from analyzing the industry and its financial and market structure and reviewing the literature, is that most airport costs, both capital and operating, will eventually be passed through to airlines and/or their customers.³⁵⁵

As discussed below, how much, if any, of the costs imposed by the Proposed Rule are “passed through” from airlines to their customers is relevant to how the impacts on airlines are assessed. The relevant question here, however, is whether the impacts on airlines must be assessed. In this context, it is enough to point out that EPA itself emphasizes that airlines have been unable to pass through increased fuel costs to passengers and concludes “[i]t appears that [at] least in the short run, it is difficult in today’s business climate for airlines to pass through a significant percentage of costs to their passengers.”³⁵⁶ Moreover, the only circumstances in which EPA asserts compliance costs would not be borne by airlines are hypothetical extremes.

³⁵² *Interim WQS Economic Guidance* at 2-5:

It is important to first define the affected community. The “community” is the governmental jurisdiction responsible for paying compliance costs. In practice, pollution control projects may serve several communities or just portions of a community. In the case of a sewage agency serving several communities, once project costs are allocated to each community served, the economic analysis is conducted on a community by community basis. In the case of a community in which only a portion of the community is served, the affected community is defined as those who will pay the compliance costs. In such cases, it may be difficult to obtain socioeconomic data for just part of the community and data for the entire community may be used instead.

³⁵³ Document - 0623 at 157-8.

³⁵⁴ Notice at 44708, col. 2.

³⁵⁵ EA at 2-44.

³⁵⁶ EA at 2-48.

In fact, its economic analysis is predicated on the assumption that airports will finance compliance costs by imposing increased rates and charges, in the form of landing fees on airlines.³⁵⁷ This is dispositive: If EPA's model assumes that costs are imposed on airlines through landing fees, analyzing the economic impacts on airlines is not a matter of choice. Just as municipalities own and operate landfills and the costs are borne by the households they serve, governmental entities (primarily municipalities) own and operate airports and the costs are borne by the airlines they serve. It follows that appropriate impact analysis of this Proposed Rule must evaluate the impact on airlines, just as the EA for the Landfill ELG evaluated the impact on households.

2. The Sales Test Cannot Be a Rational Basis for Determining Economic Achievability as to Airlines

Although EPA bases its determination of economic achievability for airlines on the "sales test," the Agency offers no reasoned explanation that the test is a valid basis for determining economic achievability. To the contrary, EPA itself affirms that the "sales test" cannot be a rational basis for determining the issue.

a. EPA Concedes that the Sales Test, by Definition, Cannot Be a Rational Basis for Determining Economic Achievability as to Airlines

EPA affirms unequivocally that it "evaluated the economic impacts on airlines using essentially the same test and impact thresholds as it did for airports."³⁵⁸ "EPA based its evaluation of impacts on operating revenues . . . This essentially applies the same standards to for-profit entities as it does to non-profits [sic] organizations and government entities."³⁵⁹ In fact, EPA used exactly the same test and thresholds to evaluate impacts to airlines as it did to evaluate impacts to airports.³⁶⁰

Yet, EPA in explaining its application of the test to airports (referred to as the Revenue Test in that context), EPA explains:

Thus, the impact of compliance costs resulting from an effluent guideline on airport income is not equivalent to that of a for-profit

³⁵⁷ Notice at 44708: "EPA examined impacts to airlines with compliance costs passed through from airports in the form of higher landing fees." EA at 3-9: "EPA assumes airports will primarily finance costs in complying with the effluent guidelines through landing fees." EA at 3-16: "The airport finance model is based on raising capital through selling bonds. The revenue stream to pay off the bonds is through increased landing fees."

³⁵⁸ EA at 5-16.

³⁵⁹ EA at 3-11.

³⁶⁰ Compare EA 3-6 and 3-11: the test and thresholds used for airports and airlines are precisely the same.

private sector business, *nor can it be analyzed in the same manner using the same benchmarks.*³⁶¹

If it is not possible to analyze the economic impacts on public sector entities (like airports) “in the same manner using the same benchmarks” that are used to analyze impacts on for-profit private sector businesses (like airlines), it is not possible to analyze airlines using “the same test and impact thresholds” that are used for airports. EPA has encapsulated why, by definition, the Airline Sales Test cannot be a rational basis for determining the economic achievability of the Proposed Rule. Indeed, EPA notes Airborne Airpark “is privately owned and is a private use facility; the revenue test *would not be appropriate* for this airport.”³⁶²

b. **EPA Itself Affirms that the Airline Sales Test Cannot Determine Economic Achievability**

EPA unequivocally affirms the “sales test” cannot determine economic achievability for airlines. The Agency states:

[A]lthough compliance costs might represent a small percentage of operating revenues, this *does not determine financial affordability* when either an airline’s operating profits or net income is negative. The question is: what level of compliance costs is affordable if an entity is losing money? That is *not* a question that can be answered using standard tests of economic achievability.³⁶³

EPA’s own analysis concludes that for the period evaluated, it found 49 to 55% of airlines did not have operating profits or positive net income.³⁶⁴ EPA thus unambiguously acknowledges that the “sales test” analysis cannot determine economic achievability with respect to 49-55% of airlines.

The analysis is not internally consistent. EPA adopted the sales test analysis for all airlines because it is a test that can be applied to all airlines (because they all have operating revenues). However, EPA rejected a comparison of compliance costs to either profits or net income apply for the very same reason: it is meaningless for about half the airline industry. In fact, EPA affirms the “results” of its analysis “do not measure affordability based on a relatively well defined outcome using a clearcut decision criterion, but rather attempt to determine if compliance costs are affordable in the sense that they are ‘small’ relative to airline income.”³⁶⁵ In acknowledging these limitations, EPA effectively concedes the Airline Sales Test does not provide the basis for reasoned decision making.

³⁶¹ EA at 3-6 (emphasis added).

³⁶² EA at 3-6, n.22 (emphasis added). EPA did not evaluate this airport because it was not included in the scope of the proposed regulation.

³⁶³ EA at 5-16 (emphasis added).

³⁶⁴ EA at 3-11.

³⁶⁵ EA at 3-12.

c. A “Sales Test” Is Applied to Airlines Such That It Measured

When the specific “sense” of affordability EPA yields from this test is critically evaluated, it is even more apparent that the test cannot form the basis of any reasoned decision. EPA describes the thresholds for affordability it applied as follows. Generally, if costs are greater than 1% for some firms, but below that threshold for most, the regulation “may be considered affordable;” when costs exceed 3% for any given entity, the regulation is considered to “place a heavy burden” on the entity.³⁶⁶ Airline industry operating revenues in 2004, 2005 and 2006 (the three years evaluated by EPA) were \$115.9, \$131.5, and \$150.8 billion³⁶⁷ respectively – resulting in an average annual operating revenue over those years of \$136.7 billion (in 2006\$).³⁶⁸ Under EPA’s analysis the 1% and 3% thresholds will not be exceeded until compliance costs are \$1.4 and \$4.1 billion, respectively. EPA estimates the total COD load to the environment associated with ADF to be 128.4³⁶⁹ and 12.7 million lbs. COD and 4.7 million lbs. ammonia from urea, for a total of 145.8 million lbs. of pollutants. Thus, if costs under this rule were \$4.1 billion, every pound of COD and ammonia could be removed at a cost of about \$28.00 per lb. This is within the range of costs for other ELGs EPA cites in the Notice, the highest being \$38.83 per lb. for the Waste Combustors rule.³⁷⁰

In short, because airline industry operating revenues are large, the Airline Sales Test could be used to justify any measures EPA may propose – a test that can be used to justify any outcome is not properly a test. It is wrong to apply such a “test” to any industry, but it is clearly not possible to justify its application to this industry, in which – as EPA acknowledges – operating revenues are (chronically) insufficient to cover operating expenses.

d. EPA Has Failed to Provide Any Relevant Basis for Adopting the Thresholds of Significance Relevant in this Rulemaking

As detailed below in Section XI, EPA has failed to provide any reasoned basis for adopting the thresholds of significance relevant to applying the “sales test” to airports (termed the “revenue test” in that context). Moreover, EPA has failed to explain why thresholds of significance that apply to airports would also reasonably apply to airlines. Thus, even if the “sales test” could be applied to airlines, EPA has failed to provide any reasoned justification for applying these thresholds for airlines.

³⁶⁶ EA at 3-11; *EPA Guidelines for Economic Analyses* at 257 (Document-0623).

³⁶⁷ Source: ATA Annual reports for 2004, 2005 and 2006, available here: http://www.airlines.org/economics/review_and_outlook/annual-reports.htm.

³⁶⁸ Calculated using Bureau of Labor Statistics’ average annual Consumer Price Index values for 2004, 2005 and 2006 (*i.e.*, 188.9, 195.3 and 201.6, respectively). BLS CPI values available here: <ftp://ftp.bls.gov/pub/special.requests/cpi/cpi.txt>.

³⁶⁹ EIB at 3-13, 4-17.

³⁷⁰ Notice at 44707, col. 1.

e. **The Airline Sales Test Does Not Evaluate Impacts on Routes and Potential Loss of Service to Particular Locations**

When airlines make service decisions about a particular market or airport, they consider primarily the revenues generated and costs incurred in that market – not at the national level based on some average U.S. airport figure. This is especially pertinent when cities/communities try to attract “low-cost/low-fare” service. It is still more pertinent when for communities seeking to attract any air service, as EPA recognized in its 1999 study of the industry:

However, the greatest potential economic impact to the industry from implementing capital improvements to reduce discharges from airport deicing operations may be a reduction of quality or frequency of service to airports that do not serve large cities (i.e., smaller airports). For example, an airline may choose to operate less flights per day into a particular airport or to operate smaller aircraft on that route.³⁷¹

While the economic analysis attempts to assess impacts on the airports which will incur costs under the Proposed Rule, it does not evaluate how increased costs at these airports may affect service to other airports. As EPA acknowledges, increasing costs at large airports will affect airline operating costs at that airport and, therefore, the costs of providing service on any route served by that airport. EPA also notes the role of the Essential Air Service (“EAS”) program in maintaining marginal routes:

[T]he government developed a program called the Essential Air Service to ensure communities’ access to air travel. Smaller commuter airlines have replaced larger carriers in providing service to these airports. Even with subsidies, which are reflected in reduced passenger fares, these smaller commuter planes are less profitable and the GAO (2007b) found that these flights are the first flights to be eliminated during times of financial downturn.³⁷²

The FAA reports that the EAS program currently maintains access to the nation’s air transportation system for many small communities by subsidizing service to large hubs that will incur costs under the Proposed Rule. A brief review of a recent report shows subsidies of routes to BOS and IAD ensure that 16 communities in Maine, New Hampshire, Vermont, New York, Pennsylvania, Virginia and West Virginia have such access.³⁷³ Similarly, subsidies to routes served by JNU and ANC ensure access to at about 15 communities in Alaska.³⁷⁴ EPA must

³⁷¹ 1999 EPA Study at 1-5 to 1-6.

³⁷² EA at 2-14.

³⁷³ See FAA, EAS and Domestic Analysis Division, *Subsidized Essential Air Service Outside of Alaska* (January 1, 2010) (available here: http://ostpxweb.dot.gov/aviation/X-50%20Role_Files/essentialairservice.htm#US).

³⁷⁴ FAA, EAS and Domestic Analysis Division, *Alaska Subsidized Essential Air Service* (January 1, 2010) (available here: http://ostpxweb.dot.gov/aviation/X-50%20Role_Files/Alaska010110.pdf). EPA also concludes that the State of Alaska would have to increase state-funded subsidies to five other rural

consider if the service provided to these communities would be threatened by the increased costs imposed by the Proposed Rule. Given the especially high ratio of projected costs to operating revenues at JNU and ANC, the routes served by these airports should be of particular concern.³⁷⁵ These impacts also need to be taken into account in EPA's Small Business Analysis.

3. The Airline Market Impact Analysis Is Meaningless

As noted above, in its Notice,² EPA asserts that, it "also analyzed the impacts of costs relative to common air carrier benchmarks for unit measures of cost and capacity such as cost per available seat-mile."³⁷⁶ Although this appears to imply some direct analysis of the amount these benchmarks are affected, there is no mention of the results of any such analysis in the Notice, EA, or any other document in the Record.

Instead, it appears that this analysis ended, ultimately, in another rendition of the "sales test" in which the denominator (airline revenues) is determined assuming airlines can pass no costs through to their customers and that airlines can pass all costs through to their customers. EPA acknowledges that the analysis initially conducted – evaluating the ratio of compliance costs to total operating revenues – is equivalent to assuming that airlines are able to pass no costs through.³⁷⁷ Assuming airlines could pass through all of their costs to customers, EPA calculated the amount airlines would raise fares throughout their route structures to cover compliance costs. To make this calculation, EPA assumed a price elasticity of demand of -1.5 (which is applied to both passenger and cargo operations, though derived looking only at passenger operations), which, according to EPA, means the increased fares would result in decreased revenues.³⁷⁸ Under these assumptions, EPA effectively lowers the operating revenue denominator against which the compliance cost numerator is compared. This, in effect, increases the possibility that the Agency's 1% and 3% thresholds may be exceeded.

This amounts to another rendition of the Airline Sales Test, which fails as a test of economic achievability for the same reasons set out in detail above.

E. EPA's Analysis of Airport Impacts Is Fundamentally Flawed and Its Conclusion that the Proposed Rule Is Economically Achievable Is Legally Insupportable as a Result

EPA deploys two measures of economic achievability of the Proposed Rule for airports: the Airport Revenue Test and Airport DSCR. As a preliminary matter, the reasonableness of

airports (BET, Ketchikan, Sitka, OME, Ralph Wein) to pay for the compliance costs imposed on these airports. EA at 5-13 to 5-14.

³⁷⁵ We believe ANC is likely a Tier One airport under EPA's proposed 460,000 annual ADF usage threshold: EPA projects costs will amount to 5.15% of operating revenues. Document - 1099 at 28. JNU is projected to incur costs amounting to 19.5% of its operating revenues. Document - 1099 at 18.

³⁷⁶ Notice at 44708.

³⁷⁷ EA at 3-14.

³⁷⁸ EA at 3-14.

both tests is predicated on the derivation of reasonable compliance costs. As noted in Section VI, EPA's assessment of compliance costs for this Proposed Rule are not reasonable – for this reason alone, EPA's revenue test does not provide a reasoned basis for its determination that the Proposed Rule is economically achievable. In already addition EPA bases its analysis on a single year of revenue data 2004³⁷⁹ - this also is fatal to the analysis. This Section addresses other deficiencies in EPA's analysis which also independently demonstrate that EPA's determination is not legally supportable.

1. **“Revenue Test”**

EPA's application of the “revenue test” to this Proposed Rule is fatally flawed. First, the “standard” EPA has used to apply the revenue test in this rulemaking has no foundation. Second, EPA's application of the test is unreasonable. Under any reasonable application of the test, EPA's Proposed Rule fails.

a. **EPA Has Failed to Provide Any Reasoned Basis for Adopting the Thresholds of Significance Relevant to Applying the “Revenue Test” to Airports**

EPA describes its methodology for applying the Airport Revenue Test in the Notice, affirming, consistent with its *Guidelines for Preparing Economic Analyses*, that:

- If annualized compliance costs are less than 1 percent of revenues, the option is generally considered affordable;
- If annualized compliance costs are greater than 1 percent, but less than 3 percent of revenues, the option may be considered affordable if only a few entities are affected and the majority incurs costs less than 1 percent;
- If annualized compliance costs are greater than 3 percent of revenues, the option is not generally considered affordable.³⁸⁰

EPA articulates this test in different terms in its *Guidelines*, observing that for the middle range (compliance costs with 1-3%), they can “probably be considered affordable” if “only a small percentage” of affected entities are in this category and “the rest fall below;” where compliance costs are above 3% of revenues, EPA states “if only a small percentage” of affected communities fall within 1-3% affirms this “indicates that the requirements are placing a heavy burden on the community.”³⁸¹

³⁷⁹ EA at 3-7: “To apply the revenue test to airports, EPA used the sum of 2004 aeronautical and non-aeronautical operating revenue.”

³⁸⁰ Notice at 44703.

³⁸¹ Guidelines at 157:

If compliance costs are less than one percent of revenues, then the requirements are usually considered to be affordable. Compliance costs in the range of one to three percent of government revenues are less easily interpreted. If all affected communities fall in this range, then further thought should be given to lowering annual compliance costs, if only a

However, it is only in the EA that EPA explains exactly how the test was applied in its decision making process in this rulemaking. Specifically, EPA explains:

The only relevant guidance EPA found for determining what might be considered an appropriate measure of “a few entities” in this context was its *Final Guidance for EPA Rulewriters: Regulatory Flexibility Act as amended by the Small Business Regulatory Enforcement Fairness Act* (2006). This guidance states that it can be presumed there is not a significant impact to a substantial number of small entities if fewer than 100 small entities or less than 20 percent of affected small entities incur costs exceeding 3 percent of revenues.³⁸²

EPA then explains:

EPA believes that (on the basis of its RFA guidance) if a substantial number of small entities would not be significantly affected by a proposed rulemaking option, then applying the same standard to large entities, which are less vulnerable to economic impacts, demonstrates that a substantial number of large entities are also not significantly affected. Thus, for the purpose of this rulemaking effort, EPA has determined:

- If fewer than 100 entities, or less than 20 percent of affected entities incur compliance costs that are less than 3 percent of operating revenues, then the option is considered affordable.³⁸³

As an initial matter, the *RFA Guidance* does not state any standard under which “it can be presumed there is not a significant impact.” To the contrary, in the *RFA Guidance* EPA repeatedly (indeed, using **bolded text** to emphasize the point) states the opposite.

In analyzing previous rules, EPA has often defined the lower threshold as compliance costs of 1% of sales and the higher threshold as compliance costs of 3% of sales as shown in the example Table 2. **The example thresholds provided in Table 2 are for illustrative purposes only and are not meant to imply a uniform standard. It is the responsibility of each program to identify appropriate thresholds for a particular rule and set of regulated small entities.**³⁸⁴

small percentage of communities fall into this range and the rest fall below one percent, then the requirements can probably be considered affordable. Compliance-cost-to-revenue ratios of greater than three percent indicate that the requirements are placing a heavy burden on the community.

³⁸² EA at 3-6, 3-7.

³⁸³ EA at 3-7.

³⁸⁴ RFA Guidance at 29 (emphasis in original).

Table 2 represents an **example** of a decision process you may use to determine whether your rule may have a SISNOSE (i.e., which category to assign to your rule). The thresholds displayed in Table 2 are 1% and 3% for determining the *significance* of the economic impact on small entities, and 100 and 1000 and/or 20% for determining if the number of small entities impacted is *substantial*. **These thresholds are only examples.** No bright line exists for determining whether a given set of economic impacts constitutes a SISNOSE. . . . EPA has not established fixed definitions for the terms, reflecting the practical difficulty of stipulating what would uniformly represent a significant economic impact or a substantial number in every regulatory circumstance.³⁸⁵

Perhaps most tellingly, EPA notes in Table 2 that:

This table and the numbers in it are given **only as examples** of the decision process and thresholds that may be chosen for a particular rule. The certification decision **should not be solely based upon the application of this table nor should this table be referenced in your preamble.**³⁸⁶

By basing its determination on the example thresholds set out in the *RFA Guidance*, EPA has unambiguously violated its own direction that it may not do this and utterly failed to fulfill the “**responsibility . . . to identify appropriate thresholds for a particular rule and set of regulated . . . entities.**”

At the very least, EPA must fulfill its responsibility to explain:

- The basis of its “determination” that “[i]f fewer than 100 entities, or less than 20 percent of affected entities incur compliance costs that are less than 3 percent of operating revenues, then the option is considered affordable.”
- Why thresholds of significance derived to apply to private sector entities may be reasonably applied to public sector entities.

b. **EPA’s Proposed Rulemaking Fails the Airport Revenue Test Under Any Reasonable Application of the Test**

i. **Even using EPA’s standard and cost estimates the Proposed Rule fails the test**

Any test of economic achievability must be applied to appropriate universe of entities – in this case, defined by the appropriate subcategories. Among Tier One Airports, under EPA’s own analysis, two will incur costs greater than 3% of operating revenues and four will incur costs between 1 and 3%. EPA’s own Notice acknowledges that in applying the adopted

³⁸⁵ *RFA Guidance* at 26 (emphasis in original).

³⁸⁶ *RFA Guidance*, Table 2 at 28, note a (emphasis added).

thresholds to determine economic achievability, it is relevant to look at “those airports that would incur costs under [the] proposal.”³⁸⁷ Here, among the 14 airports in the Tier One, EPA projects only seven would incur costs – of these seven, two would incur compliance costs greater than 3% of operating revenues and four will incur costs between 1 and 3%. Thus, 29% of affected Tier One airports incur costs greater than three percent of operating revenues and 57% incur costs between 1 and 3% of operating revenues.

ii. **When proper methodology is applied (proper costs; revenue limited to aeronautical revenue), the Proposed Rule fails by a wider margin**

As demonstrated at length in Section VI, EPA’s cost estimates are off by a wide margin: actual costs imposed under this proposal would be much, much higher. This means any actual cost-revenue ratios also are much higher. EPA simply cannot make any determination of economic achievability based on the Airport Revenue Test unless it derives accurate cost estimates.

Moreover, EPA uses an inappropriate denominator to calculate this ratio: total operating revenue should not be used. At a minimum, the denominator for calculation should be “aeronautical revenue;” more appropriately, it should be aeronautical revenue associated with deicing operations. These denominators will be much smaller than the total operating revenue value used in EPA’s calculation, again leading to much higher cost-revenue ratios. If EPA is to use this test, it must recalculate the ratios using accurate costs and a more appropriate measure of airport revenues.

2. **Debt-Service Coverage Ratio (DSCR)**

In applying its test where one entity owns and/or operates more than one airport, EPA apparently aggregates operating revenues. While we have not had the opportunity to complete an in-depth study of this aspect of EPA’s analysis, this approach needs to conform to anti-diversion requirements and other Federal policies.

F. **EPA’s “Cost and Pollutant Reduction Comparisons” Are Flawed**

As noted elsewhere in these Comments, the “cost-effectiveness” of the Proposed Rule should not and cannot be evaluated by combining the costs of the wholly distinct and completely separable costs/removals associated with the requirements applicable to ADF and those applicable to pavement deicing. The proposed BAT applicable to pavement deicing (substitution of urea-based products³⁸⁸) achieves large pollutant removals at – relative to the costs associated with ADF requirements – low cost. As a result, evaluating the cost-effectiveness of the Proposed Rule as a whole masks the high costs associated with the requirements applicable to ADF.

³⁸⁷ Notice at 44705.

³⁸⁸ EPA has not estimated the costs associated with capture of pavement runoff and treatment to the proposed standard for ammonia-as-nitrogen; but its preliminary analysis concluded such costs would be so large as to be prohibitive.

XII. EPA’S ANALYTICAL METHODOLOGY IS FUNDAMENTALLY FLAWED

As stated above, the airport deicing industry cannot be regulated reasonably under an ELG. If the Agency is going to attempt regulation, however, EPA must change its analytical approach to this industry. In these comments we offer many examples of instances in which the Agency attempts to derive metrics based on limited data from a limited number of airports and apply them to airports across the country. This approach is unreasonable as demonstrated by the examples provided in these comments. At the very least, when considering application of a standard to a limited number of airports (e.g., ADF Collection for Tier One airports), the Agency should not rely on metrics (e.g., the metric for estimating capital costs for CDPs) based in part on information from airports that have been excluded from the scope of the regulation (e.g., CAK). Rather, the Agency should use as much real, directly applicable information as possible to capture the site-specific issues that ADF application, collection and treatment pose.

A. EPA’s Analytical Methodology Does Not Accommodate Variability

EPA acknowledges, even highlights, the extreme variability of the industry, but then ignores it by adopting a methodology which relies on limited data to derive linear metrics. This largely is a result of Agency’s refusal, even as it acknowledges the breadth and depth of complexity inherent in the activity it is seeking to regulate, to meet the challenges presented by adopting analytical methodologies that adequately capture and reflect those complexities.

This problem is compounded by EPA’s statistical modeling, particularly with respect to Tier Two airports and as it relates to EPA’s cost estimates for those airports. Many Tier Two airports upon which EPA bases its cost estimates do not exist in the real world, but rather are “modeled” airports represented in EPA’s cost models by real world airports. Many of these airports are assumed to be “zero cost” airports because their real world alter egos have been determined to be zero cost airports. EPA projects that 96 airports will be Tier Two airports;³⁸⁹ of these, only 75 actually exist in the real world. The other 21 airports are not real airports, but are represented by real world airports included in the models, but assigned a statistical weight >1.0; these airports not only represent themselves, but other (or a portion of other) airports. Specifically, of the 75 real world Tier Two airports in the model: 58 have a statistical weight = 1.0 (these airports represent only themselves); and 17 have statistical weights >1.0 (they represent not only themselves, but 21 additional airports). For example, GRR has a weight of 1.586, BHM 2.841, and TUS 3.000. So GRR represents not only itself but 0.586 of an airport assumed to be identical to it, while TUS represents not only itself but two other airports assumed to be identical to it. Fully 22% of the Tier Two airports in EPA’s model (21 of the 96) are not real airports, but modeled airports.

Only four of the 17 real world airports with statistical weights >1.0 are assumed to incur costs because their real world alter egos are assumed to incur costs. In contrast, the remaining 13 of the real world airports with statistical weights >1.0 are assumed to have “zero costs” because their real world alter egos are assumed to have zero costs. In sum, there are four real world airports that have been determined to incur costs (BHM, ROA, FWA and XNA) that represent

³⁸⁹ Notice at 44691, Table VII-2.

8,881 total airports, representing five purely hypothetical “modeled” airports; while there are 13 real world airports that have been determined to incur no costs representing 16 purely hypothetical “modeled” airports. It is not clear from the analyses provided by EPA that a real world airport can appropriately be used to represent the costs that would be expected to be incurred by “modeled” (*i.e.*, purely hypothetical) airports. This is because the compliance status of a particular airport (whether it already achieves the proposed standards) is based on factors that do not appear to be factors considered in assigning statistical weights to airports. It appears that statistical weighting is based on the number of departures and SOFP days, not factors that determine an airport’s current ability to meet proposed standards.³⁹⁰ In addition, there appears to be no basis for concluding that the amount of the costs incurred by “modeled” airports can be based on their real world alter egos. In short, it appears that of the 50 Tier Two airports EPA says will be “zero cost” under the Proposed Rule, 16 – fully 32% – are purely hypothetical “modeled” airports and there is no basis for assuming these airports are “zero cost.”

B. EPA’s Analytical Methodology Does Not Adequately Analyze Pollution Prevention

First, the Agency must change its approach to pollution prevention and consider the extent to which the selection of glycol collection BAT and glycol treatment BAT serves to maintain (and perhaps even increase) glycol usage levels. The Proposed Rule would require airports and airlines to invest heavily in technologies that depend on high levels of glycol usage, and thus would reinforce rather than prevent glycol use at current levels. This violates EPA’s clear statutory duty under both the CWA and the PPA to recognize and facilitate pollution prevention practices. It also is not consistent with the Agency’s affirmed policies. In fact, EPA recognizes that the ELG program presents a unique opportunity to encourage pollution prevention: “Unlike other CWA tools, effluent guidelines provide the opportunity to promote pollution prevention and water conservation.”³⁹¹

Factually, EPA’s proposed approach both ignores the potential of pollution prevention practices to reduce ADF discharges and reinforces existing usage of ADF by selecting BAT for collection and treatment that relies on high levels of glycol to be effective. For example, the selected technology basis for the proposed ADF Treatment BAT, AFBRs, requires the use of glycol. In vernacular terms, EPA concludes glycol eating bugs reflect the “best” technology available; however, if you stop feeding the bugs what they need (glycol) in sufficient quantity, they die. In addition, the efficacy of the model collection technologies upon which EPA has based its ADF Collection BAT standards is affected by ADF usage levels. Generally, as the amount of fluid used in association with a CDP decreases, the percentage of fluid available for

³⁹⁰ See Document-1149 at 34 (“The purpose of modeling is to identify parameters that can be used for prediction of glycol use”) and Document-1160 (statistical weights were assigned based on departure levels and SOFP days). This model also under-represents airports that may have lower ADF use as a result of fewer operations or a milder climate. Document-1149 at 29 (“[S]tatistical inference utilizing airports in the statistical sample to the whole populations of airports becomes *less reliable* with respect to the airports that are smaller and/or have fewer SOFP days.”) (emphasis added).

³⁹¹ EPA, *Technical Support Document for the Preliminary 2010 Effluent Guidelines Program Plan* at 1-2 (October 2009).

capture decreases (because a larger percentage is “lost” due to dispersion and evaporation). Likewise, for GRVs, lower amounts of fluid are more difficult to collect. Moreover, if the amount collected is measured in terms of oxygen demand, unless the methodology for determining whether the collection standard is met is adjusted accordingly, using fluids with lower oxygen demand profiles will make it more difficult to achieve the collection standard. Thus, regulated entities will be discouraged from employing pollution prevention measures because it will be harder to meet the collection standards established on the basis of EPA’s model technologies that focus exclusively on capturing ADF after its application.

By allowing – and in some cases, requiring – permit writers to ignore the pollution elimination effects of pollution prevention practices, EPA provides a powerful disincentive to airports and airlines considering investment in those proven technologies. Far from enabling the regulated community to employ pollution prevention on an equal footing with other control techniques, the Proposed Rule places the regulated community in the position of adopting pollution prevention with no assurance that the investment will be appropriately recognized by permit writers. The Proposed Rule would require adherence to numeric collection standards that will be more difficult to meet when pollution prevention practices are employed.

Conferring authority upon permit writers to accept or reject the known impacts of pollution prevention practices also exceeds the statutory authority under which EPA promulgates ELGs. To the extent that permit writers use this express authority to deny credit, EPA effectively empowers those permit writers to deprive the regulated community of the option of using pollution prevention technologies. By empowering permit writers to withhold that recognition, EPA effectively allows them to ban the use of pollution prevention practices. Such power to dictate technologies is not conferred upon EPA by the CWA and, thus, cannot be conferred by EPA on individual permit writers.

Finally, EPA is under an affirmative obligation to consider and facilitate the adoption of source reduction techniques. That obligation flows from the PPA, which affirmatively established as a national policy of the U.S. that “pollution should be prevented or reduced at the source whenever feasible.”³⁹² In order to achieve this, EPA is directed “to develop and implement a strategy to promote source reduction.”³⁹³ As a part of this strategy, the Administrator is further specifically directed to “ensure that the Agency considers the effect of its existing and proposed programs on source reduction efforts and . . . review regulations of the Agency prior and subsequent to their proposal to determine their effect on source reduction”³⁹⁴ and to “facilitate the adoption of source reduction techniques by businesses.”³⁹⁵ These 1990 mandates are wholly consistent with the overall goal of the CWA, which is to eliminate the discharge of pollutants into navigable waters.³⁹⁶ More particularly, the PPA follows on and makes more concrete the broad mandate of the 1972 statute to, after careful investigation,

³⁹² Pollution Prevention Act of 1990, 42 U.S.C. §§ 13101, *et seq.*

³⁹³ 42 U.S.C. § 13103(b).

³⁹⁴ 42 U.S.C. § 13103(b)(2).

³⁹⁵ 42 U.S.C. § 13103(b)(5).

³⁹⁶ 33 U.S.C. § 1251(a)(1).

develop comprehensive programs for preventing, reducing, or eliminating the pollution of the navigable waters in cooperation with other Federal agencies, State water pollution control agencies, interstate agencies, and affected industries and municipalities.³⁹⁷ The Proposed Rule does not recognize these affirmative obligations or implement these clear congressional mandates.

The aviation industry has a long and successful history of exploring and implementing practices that, consistent with ensuring the safety of the flight operations, reduce the amount of ADF employed during ground deicing. Examples of this include pioneering of hot air deicing, hybrid deicing vehicles, enclosed bucket deicing vehicles, systems both on deicing vehicles and at stationary dispensaries that blend ADF to temperature, and the exploration of infrared deicing systems. Each of these, employed at an airport at which its use is both safe and appropriate, can reduce the amount of ADF necessary to ensure safe flight operations. Leading up to the Proposal, EPA studied aircraft deicing practices for over 15 years³⁹⁸ and is aware of the variety and efficacy of these practices.³⁹⁹ EPA is also aware that the use of pollution prevention techniques, while contributing to the reduction of overall pollutant discharge loads, degrades the performance of EPA's model treatment technologies so that these approaches cannot, when used in tandem, comply with the proposed collection standards. To now impose collection standards that effectively preclude the use of pollution prevention techniques is contrary to the intent of the Clean Water Act and will institutionalize current usage levels rather than encourage source reduction. EPA's failure to address and support pollution prevention must be remedied.

C. The Proposed Rule Relies on Stale Information

EPA based the Proposed Rule on data collected between 1992 and 2006. The information relied upon – some of which is up to 16 years old – is not an accurate representation of the current state of the industry. EPA's reliance upon such stale data to support the development of the Proposed Rule is unlawful, both as an arbitrary and capricious act under the APA and as a direct contravention of the requirements of the CWA.

Section 304(m)(1) of the CWA requires EPA to promulgate an ELG no later than three years after EPA identifies the source category in a plan published in the Federal Register. In September of 2004, EPA published an EGP that identified the Airport Deicing source category.⁴⁰⁰ Yet a full five years passed before the agency issued the proposed Airport Deicing ELG.⁴⁰¹ Section 304(m) reflects Congressional intent that EPA should act with due speed to

³⁹⁷ 33 U.S.C. § 1252(a).

³⁹⁸ See "Preliminary Data Summary: Airport Deicing Operations (Revised)" (EPA-821-R-00-016, August 2000), reporting on data collection efforts dating at least to 1993 and containing 23 pages of detailed descriptions of then-current pollution prevention practices.

³⁹⁹ An entire chapter of the TDD supporting the Proposed Rule is entitled "Pollution Prevention and Treatment Technologies Applicable to Airport Deicing Operations," (Chapter 8), with a full subchapter ("Pollution Prevention and Product Substitution Practice," Subchapter 8.3) devoted to existing use of pollution prevention practices within the industry.

⁴⁰⁰ 69 Fed. Reg. 53705 (Sept. 2, 2004).

⁴⁰¹ 74 Fed. Reg. 44676 (Aug. 28, 2009).

promulgate an ELG. Compliance with § 304(m) is protective of the environment, as it compels timely development and implementation of pollution control measures after EPA identifies an industry it believes is subject to rulemaking. The timing provision is also protective of the subject industry. Congress understood that EPA would require time to gather information and develop the ELG. The statutory three year period ensures both that the Agency regulates with dispatch and that the information used as a basis for its regulation is presumptively current and relevant.

Courts have recognized the protective nature of the timing provisions of Section 304(m). For example, they have held that EPA must utilize current cost figures and update their regulations on the basis of the best information available. *CPC International Inc v. Train*, 515 F.2d 1032, 1051 (8th Cir. 1975); *Grain Processing Corp. v. Train*, 407 F. Supp. 96, 106 (S. D. Iowa 1976).

The use of stale information is especially problematic given the rapid changes occurring in the aviation industry. Significant changes in the industry affect many factors that directly relate to assumptions underlying EPA's proposed rule. For example, the Proposed Rule fails to account for the rapid evolution of deicing technology, practices, and application techniques, changes to the level of activity in the industry, and changes to the fleet mix. Moreover, due to its use of out-dated cost information, the ELG fails to reflect the current economic realities of the industry and the impact of capture and treatment costs. EPA must provide a "reasonable basis" for its belief that a new technology will be available and economically achievable. *Hooker Chemicals & Plastics Corp. v. Train*, 537 F.2d 620, 634-35 (2d Cir. 1976). Yet it is inherently unreasonable for the Agency to base its determination that a technology is "economically achievable" on cost information that no longer reflects the state of the industry.

XIII. EPA'S PROPOSED RULE IS CONTRARY TO LAW

Throughout these Comments we have identified many instances in which the Agency has failed to fulfill its statutory or other legal obligations. In this Section, we identify other instances and provide additional detail on others.

A. EPA Impermissibly Failed to Develop Proposed "BPT" and "BCT" Standards as a Part of This Rulemaking

In the Proposed Rule, EPA affirmatively declined – for the first time in the 34-year history of the ELG program – to identify BPT and BCT. EPA asserts it is taking this entirely novel approach "because the BAT controls in this rule also control the same pollutants as would be controlled by BPT or BCT limits" and, with respect to BCT only, "because these limitations apply only to conventional pollutants such as BOD5 and total suspended solids and this effluent guideline regulates only nonconventional pollutants (chiefly COD and ammonia)."⁴⁰² EPA also notes that it "solicits comments on this approach," *i.e.*, failing for the first time in its history to develop BPT and BCT, "because it represents significant resource savings for EPA in terms of

⁴⁰² Notice at 44694, cols. 1-2.

analysis and rulemaking process while not sacrificing any environmental protection.”⁴⁰³ EPA does not clarify whether its (wholly unsubstantiated) claim that taking this approach yields “significant resource savings . . . without sacrificing environmental protection” is also offered as a justification for its proposed “approach.”

As discussed below, EPA’s proposed approach is illegal. At the outset, we note that the Agency concedes that the approach it proposes to take in this rulemaking is entirely novel – “EPA recognizes that it has proposed, in the past, all three levels of control, BPT, BCT and BAT for various industries even where the same pollutants and wastestreams were at issue.”⁴⁰⁴ A review of EPA’s webpage devoted to the ELGs it has promulgated bears this out – indeed, in no instance has EPA failed to promulgate BPT.⁴⁰⁵

EPA may not deviate from its established interpretation of governing statutes, even if the deviation could be deemed “reasonable” and given due deference by a court. It cannot deviate so substantially in its decisional process in this one rule without a sound justification that distinguishes the present case from the Agency’s consistent past practice. Such inconsistency is grounds for finding agency action arbitrary and capricious. *Nat’l Cable & Telecomms. Ass’n v. Brand X Internet Servs.*, 545 U.S. 967, 981 (U.S. 2005). Such deviation certainly cannot be justified on the mere grounds (even if substantiated, which it is not in this context) that it saves resources or does not compromise some broader statutory objective (*e.g.*, environmental protection⁴⁰⁶). The reason is simple and rooted in our fundamental law: The government cannot regulate according to one set of principles applicable to one party and another set of principles applicable to everyone else. Further, the Agency cannot deviate from its established interpretation of the statutory provisions governing promulgation of ELGs through this rulemaking, which is applicable to only a narrow portion of interested parties. That is, unless and until the Agency undertakes a separate, more inclusive process for changing its interpretation of the statutory provisions governing promulgation of ELGs, it cannot follow the changed position in this rulemaking.

We also note that whether the proposed approach is legally viable does not depend on whether the public is able to articulate a reason or reasons the approach is invalid – to the contrary, it falls to the Agency to establish the legality of its approach. That is, whether it may pursue the proposed “approach” depends on whether the Agency can articulate a legal basis for following the approach, not on whether the public can establish that the approach is illegal. In any event, it is not good public policy for the government to take action that it recognizes may not be consistent with its legal obligations. The Agency should not pursue this course unless it is convinced that it is consistent with its legal obligations, even if not fulfilling those obligations would reap “significant resource savings.” Having raised the issue – both by soliciting

⁴⁰³ Notice at 44694, col. 2.

⁴⁰⁴ Notice at 44694, col. 2.

⁴⁰⁵ See <http://www.epa.gov/waterscience/guide/industry.html>.

⁴⁰⁶ As explained below, we believe this approach *does* compromise environmental objectives because the Agency is focused on *chemical* oxygen demand rather than – as Congress required under the CWA – *biological* oxygen demand.

comments and by proposing this course – the Agency is now under an affirmative obligation to explain the legality of following that course.

1. EPA Has a Non-Discretionary Duty Under the CWA to Establish BPT, BCT and BAT

When EPA develops an ELG, it has a non-discretionary duty under the plain language of the CWA to identify BPT, BCT, and BAT. Section 304(b) of the Act establishes that obligation unambiguously:

(b) For the purposes of adopting or revising effluent limitations under this Act the Administrator shall, after consultation with appropriate Federal and State agencies and other interested persons, publish within one year of enactment of this title, regulations, providing guidelines for effluent limitations, and, at least annually thereafter, revise, if appropriate, such regulations. *Such regulations shall—*

(1)(A) *identify*, in terms of amounts of constituents and chemical, physical, and biological characteristics of pollutants, the degree of effluent reduction attainable through the application of the *best practicable control technology currently available* for classes and categories to point sources (other than publicly owned treatment works); . . .

(2)(A) *identify*, in terms of amounts of constituents and chemical, physical, and biological characteristics of pollutants, the degree of effluent reduction attainable through the application of the *best control measures and practices achievable* including treatment techniques, process and procedure innovations, operating methods, and other alternatives for classes and categories of point sources (other than publicly owned treatment works); . . .

(3) . . . and

(4)(A) *identify*, in terms of amounts of constituents and chemical, physical, and biological characteristics of pollutants, the degree of effluent reduction attainable through the application of the *best conventional pollutant control technology* (including measures and practices) for classes and categories of point sources (other than publicly owned treatment works); . . .

33 U.S.C. § 1314(b) (emphasis added).

Initially and most directly, then, it is beyond EPA’s authority under the CWA to decide against identifying BPT or BCT. Again, savings of resources or consistency with some broader statutory objective will not excuse ignoring Congress’ unequivocal and unambiguous directive that EPA “shall identify” each specified level of control. EPA simply has no choice but to devote the resources necessary to meet this statutory mandate.

2. EPA Must Develop BPT and BCT in This Rulemaking Because – Despite Assertions to the Contrary – by Establishing ADF Collection and Treatment Standards It Is Regulating a Conventional Pollutant (BOD), Not a Non-Conventional Pollutant (COD)

As discussed below, EPA has made the judgment that COD is the appropriate “regulated pollutant” for the ADF portion of this rulemaking. By designating this nonconventional pollutant as the “regulated pollutant,” and then developing a proposal only at the BAT level, the Agency has avoided the need to characterize the levels of treatment that would be needed when applying the cost-effectiveness tests applicable to BPT and the two-part cost sensitivity analysis that the Congress had mandated for BCT to that “same pollutants” (*i.e.*, BOD).

Stated more directly, by asserting that COD rather than BOD is the appropriate pollutant to be regulated, EPA deprives the regulated industry of the more robust cost and other protections to which it is entitled under law. More importantly, the bald assertion that the appropriate “regulated pollutant” is COD rather than BOD, facilitates the imposition of BAT, which is potentially much more stringent and costly than BPT or BCT. We cannot know whether BAT is in fact more stringent and costly than BPT and/or BCT because EPA has failed to tell us what BPT and BCT are. What we do know is that, if BOD (a conventional pollutant) is the appropriate regulated pollutant, EPA would have no choice but to set BPT, then undertake a two-pronged analysis of BCT to determine whether the incremental costs of upgrading from BPT to BCT are justified. That is, the analysis would be: (1) what is “average of the best performances of the facilities within the industry,” considering various factors;⁴⁰⁷ and (2) whether the imposition of BCT could be justified given the *incremental* reductions in pollutants emitted into the environment and the *incremental* increase in costs.⁴⁰⁸ This obviously is a much different analysis than that applicable when imposing BAT: *i.e.*, whether the proposed technology is “available” and “economically achievable.” Again, it is not possible to know whether the proposed BAT is indeed more stringent and costly than BPT⁴⁰⁹ or BCT because EPA has not done the analysis necessary to ascertain the issue. Indeed, it is beside the point: the regulated pollutant under this rule should be BOD, not COD, and EPA must provide the analysis that supports selection of BPT and, if justified, BCT.

⁴⁰⁷ Notice at 44678, col. 3 and at 44679, col. 1. While the Agency reserves the ability to impose more stringent controls than achieved by the average best performances, it does so only if it determines that “existing performance is uniformly inadequate.” The Administrative Record establishes that the opposite is true.

⁴⁰⁸ See *Technical Development Document for the Final Effluent Limitation Guidelines and Standards for the Meat and Poultry Products Point Source Category* at 13-2 to 13-3 (2004).

⁴⁰⁹ Of course, if EPA determines that BPT represents the highest level of control that is “economically achievable,” BAT is set to be equivalent to BPT. We note that even if EPA were correct to deem COD as the “regulated pollutant” it cannot escape its statutory duty to determine BPT, if it determines BAT can be justified.

We find EPA's assertion that it may establish only BAT and forego establishing BCT "[b]ecause the BAT controls in this rule also control the *same pollutants* as would be controlled by . . . BCT,"⁴¹⁰ wholly unsupportable as a legal matter. BAT and BCT by definition control different pollutants, non-conventional pollutants in the former case, conventional in the latter. Within the context of the CWA it simply makes no sense to assert that BCT would control the "same pollutants" as BAT. We believe on the other hand that this statement "proves too much" – that is, it unintentionally discloses that EPA understands that the "pollutants" it is controlling are not COD or BOD *per se*.

B. EPA Impermissibly Designates COD as the "Regulated Pollutant"

In this rulemaking, EPA has selected two "regulated pollutants" – COD and ammonia as nitrogen.⁴¹¹ Here, we focus on the Agency's selection of COD, a nonconventional pollutant, over BOD, a conventional pollutant, as the "regulated pollutant." As a practical matter, the reasons EPA identifies for selecting COD over BOD do not withstand scrutiny and, in fact, mitigate in favor of selecting BOD over COD. More importantly, the reasons EPA identifies are not sufficient to excuse its failure to overcome the Congressional mandate to and to establish BPT and BCT.

1. The Distinction Between BOD and COD Is Not Merely Technical But Legal Reflecting Congress' Mandate that EPA Evaluate and Address Distinct Environmental Concerns Under the ELG Program

COD and BOD measure very different types of oxygen demand. On one hand, "BOD is an estimate of the oxygen-consuming requirements of organic matter decomposition under aerobic conditions" and "is determined by measuring the depletion of dissolved oxygen resulting from aerobic microbial activity . . . during incubation at 20 degrees celsius over a fixed period of time."⁴¹² In contrast, COD "is the measure, using a strong oxidizing agent in an acidic medium, of the oxygen equivalent of the oxidizable organic matter present."⁴¹³ COD is almost always higher than BOD precisely because it measures the oxygen demand of pollutants that are not readily metabolized by biological organisms.

However, the distinction between BOD and COD is not merely technical. In Section 304(b)(4) of the CWA, Congress required EPA to identify "conventional pollutants," expressly including "biological oxygen demanding" pollutants. When it considered whether to list COD as a conventional pollutant, the Agency cogently highlighted the specific concerns animating Congress' mandate:

Based on its assessment of the Clean Water Act and its legislative history, EPA concluded that conventional pollutants include

⁴¹⁰ Notice at 44694, col. 1 (emphasis added).

⁴¹¹ TDD at 7-11.

⁴¹² *Technical Development Document for the Final Effluent Limitations Guidelines and Standards for the Meat and Poultry Products Point Source Category*, at 7-6 to 7-7.

⁴¹³ *Technical Development Document for the Final Effluent Limitations Guidelines and Standards for the Meat and Poultry Products Point Source Category*, at 7-7.

substances which, among other things, may be biodegradable or oxygen demanding. The Agency believes this reflects Congress' concern for the traditional problem of degradation of the dissolved oxygen available to biota.⁴¹⁴

Thus, EPA recognizes the need to adhere to Congress' explicit direction to distinguish carefully between conventional and non-conventional pollutants in part to ensure the "traditional problem" posed by biological oxygen demand is appropriately addressed. Indeed, EPA based its decision not to list COD as a conventional pollutant and to instead treat COD "as a 'non-conventional, non-toxic' pollutant" precisely on the grounds that COD measures "substances" that are not relevant to Congress' specific and unequivocal concern about biological oxygen demand:

COD is a parameter which measures a range of substances that are oxygen demanding. Although certain fractions of the materials measured by COD do deplete oxygen available to aquatic organisms, other fractions, identifiable as oxygen demanding under certain conditions of temperature and pH, do not as a practical matter deplete oxygen available to organisms. Therefore, the Agency does not believe that it would be appropriate to identity [COD] as a conventional pollutant . . .⁴¹⁵

Congress emphasized the significance of the distinction between conventional and non-conventional – and so, between BOD and COD – and the need to appropriately address the concerns posed by each, when it carefully distinguished between BCT and BAT and provided for substantially different cost-effectiveness tests that must be applied for determining each. As stated above, the Agency's failure to evaluate BCT is an independent violation of the CWA. In some sense it follows from and compounds the failure to designate BOD rather than COD as the "regulated pollutant" in accordance with the statute.

In short, the question of whether BOD or COD should be designated as the "regulated pollutant" in this rulemaking is one that must be resolved carefully as the resolution of the issue has significant, Congressionally-mandated consequences.

2. EPA's Selection of a *Biological* Treatment System as BAT Establishes that *Chemical* Oxygen Demand Cannot Be the Regulated Pollutant

BOD and COD are closely related, but this is not a reason to blur the distinction between the two pollutants. Most prominently, both BOD and COD are measures of the "oxygen demand" of pollutants – that is, the amount of oxygen in water consumed as pollutants break down. In addition, though they are both pollutants under the CWA in their own right, BOD and COD are most appropriately conceived as "indicator pollutants," or pollutants that stand for or measure the presence of other pollutants. EPA often selects BOD and/or COD as regulated pollutants for precisely this reason and we do not challenge the legality of or object to this practice.

⁴¹⁴ 44 Fed. Reg. 44501 at 44502 (July 30, 1979).

⁴¹⁵ 44 Fed. Reg. 44501 at 44502 (July 30, 1979).

We do not challenge the proposition that COD may be an “indicator” of the presence of substances directly associated with aircraft deicing operations. While we do disagree with EPA’s assertion that COD is a “better” indicator of such substances than BOD, here we contend that *even if COD could be considered a better indicator pollutant* it does not resolve the question of which pollutant the Agency is in fact regulating. The critical determination for regulation is not whether oxygen demand can be (or is “best”) measured using COD or BOD. Indeed, the Agency has conceded that the oxygen demand it is controlling here can be measured using either BOD or COD. In contrast to other contexts in which it has stated it is not possible,⁴¹⁶ EPA has determined that a reliable COD/BOD ratio can be established:

EPA developed an industry-specific relationship between COD and BOD₅ using analytical data for untreated deicing stormwater from the EPA sampling episodes at Albany International airport, Pittsburgh International airport, and Denver International airport. The average COD/BOD₅ ratio was 1.67. This relationship was used to calculate the BOD₅ associated with the degradation of the deicing chemical. See the *Airport Deicing Loading Calculations* memorandum (ERG, 2008d) for more information.⁴¹⁷

In other words, for purposes of measuring oxygen demand it does not really matter which “indicator” pollutant one uses as either is easily converted into an equivalent value.

The critical determinate of whether the oxygen demand EPA is regulating is BOD or COD, is how the Agency is proposing to regulate, in physical terms, oxygen demand. In lay terms, it is what EPA is proposing airports/airlines do to limit discharges of oxygen demand, not how it is measured, that determines the character of the discharge. Here, the Agency has determined that a biological treatment system is the best technology available for controlling oxygen demanding substances entrained in wastewater from aircraft deicing activities. A

⁴¹⁶ EPA often has emphasized that such ratios often are source (plant) specific. See *Development Document for Proposed Effluent Limitations Guidelines and Standards for the Pharmaceutical Manufacturing Point Source Category* at 5-9 (February 28, 1995):

The COD test cannot be substituted directly for the BOD₅ test because the COD/ BOD₅ ratio is extremely variable and dependent on the specific chemical constituents in the wastewater. In addition, the COD test measures refractory organics, which the BOD₅ test does not. A COD/ BOD₅ ratio for the wastewater from a single manufacturing facility with a constant product mix or from a single manufacturing process may be established. This ratio is applicable only to the wastewater from which it was derived and cannot be used to estimate the BOD₅ of another facility’s wastewater.

⁴¹⁷ TDD at 10-19. The cited memorandum, Document - 1107 at 13 contains identical language: contrary to EPA’s representation the memorandum provides no “more information.” See also, *Technical Development Document for the Final Effluent Limitations Guidelines and Standards for the Meat and Poultry Products Point Source Category*, at 7-7 (“For many types of wastewaters, the ratio between BOD and COD is relatively constant. When such a relatively constant ratio exists, COD can be used as a surrogate to estimate the impact of wastewater discharges on natural wastewaters.”)

biological treatment system by definition cannot treat substances that are unavailable to biota and therefore, control/regulate their discharge into the environment.

If EPA were in fact regulating COD as distinct from BOD, it no doubt would be compelled to require adoption of treatment technology that in fact controlled COD as distinct from BOD.⁴¹⁸ To the contrary, while the AFB systems EPA has identified as the best technology available for treating aircraft deicing wastewater certainly will treat those “certain fractions of the materials measured by COD [that] do deplete oxygen available to aquatic organisms,” they just as certainly will not treat those “other fractions . . . [that] . . . do not as a practical matter deplete oxygen available to organisms.” In other words, AFBs will not and cannot treat precisely those “fractions” that make the “oxygen demand” regulated by EPA non-conventional (*i.e.*, COD), rather than conventional (*i.e.*, BOD).

In short, by selecting AFBs as BAT, EPA effectively has conceded that, no matter what it calls it or how it measures it, the oxygen demand it is regulating is biological not chemical oxygen demand.⁴¹⁹

3. **EPA Acknowledges That COD Does Not Accurately Reflect Actual Degradation of the Dissolved Oxygen Available to Biota**

It is the biological degradation reflected by the BOD test and not the chemical oxidation of the COD that most nearly mirrors the impact of discharges from this industry. The Agency itself has recognized this fact in its deliberations.

The downside of using COD as the regulated pollutant for ADF-contaminated stormwater is that COD does not mimic the actual potential oxygen depletion in the receiving stream by naturally occurring bacteria due to the aggressive nature of the analytical method and its ability to oxidize even biologically resistant organic materials.⁴²⁰

⁴¹⁸ The only substances that EPA claims to be “regulating” using “COD as a surrogate” are PG, EG and acetone, all of which are readily treatable with biological systems. See Table 7-2, TDD at 7-12. As noted below, acetone is not properly regulated as it is not directly associated with aircraft deicing activity. That acetone is treatable by biological systems is suggested by EPA’s data in this proceeding, which indicates the presence of acetone in influent to the ALB system and much reduced levels in effluent. See Document - 0731, Tables 5-3 to 5-5. See also World Health Organization, *Environmental Health Criteria 207: Acetone* at 4.2.2. (1998) (studies “indicate that acetone is easily biodegradable with acclimatized microorganisms”).

⁴¹⁹ The Agency’s proposed COD effluent limitations are not legally supportable on these grounds as well. While EPA has considerable discretion in identifying pollutants of concern, it is “unreasonable” to “establish an effluent limitation for a pollution parameter when the Agency’s technological model does not include treatment procedures for that pollutant.” *FMC v. Train*, 539 F.2d 973, 983 (4th Cir. 1976).

⁴²⁰ Document - 0734 (Memorandum re *Regulation of COD for Airport Deicing Operations*, to Brian D’Amico, EPA from Mark Briggs and Mary Willett, ERG (Sept. 11, 2008)). See also, U.S. EPA, Region 10, *Total Maximum Daily Loads (TMDLs) for Dissolved Oxygen and Iron in the Waters of Duck Creek in Mendenhall Valley, Alaska* at 19-20 (October 2001) (“Organic chemicals like ethylene glycol and

Similarly, the TDD observes that “COD eliminates the need to consider receiving water temperature when evaluating water quality concerns.”⁴²¹ While possibly a convenience for the technician, the fact that the COD test does not account for the temperature of the receiving water makes it inferior to BOD as a test for this industry which, as the Agency is aware, discharges as a result of and, thus, during cold weather.

Here, BOD most nearly represents the characteristics of discharges from the ADI as those discharges are experienced by the receiving waters.

More specifically, BOD more clearly indicates whether the “traditional problem of degradation of the dissolved oxygen available to biota” is being addressed, precisely what EPA has cited as the Congressional concern at the heart of the distinction between COD and BOD. In these circumstances, there is a presumption in favor of selecting BOD as the indicator pollutant which should only be overcome if COD is indisputable superior to BOD. As detailed below, EPA provides no such reasons.

4. **EPA’s “Reasons” for Asserting that COD Is a Better Indicator of “Pollutants Directly Associated with Aircraft Deicing Chemicals” Do Not Withstand Scrutiny**

As noted above, EPA acknowledges that its choice of COD over BOD is based, not on which of these pollutants should be regulated, but on which parameter is a better “indicator” of the pollutants it intends to regulate:

EPA determined that pollutants directly associated with aircraft deicing chemicals could be associated with an indicator pollutant. Initially, both COD and BOD5 were identified as possible indicator parameters. The Agency determined that COD is the best indicator for the following reasons⁴²²

As pointed out above, this is not sufficient to sustain the Agency’s determination that it is “regulating” COD rather than BOD. Moreover, it is not true that COD is a “better” indicator of “pollutants directly associated with aircraft deicing chemicals” than BOD in any event. EPA posits four “reasons” for selecting COD over BOD on pages 44689-90 of the Notice, each of which we address in turn.

propylene glycol can also deplete DO. These chemicals are deicing agents found in automotive antifreeze and have a high chemical oxygen demand (COD). . . . Because the laboratory COD measurement uses strong oxidative reagents, it is likely to reflect a much stronger oxygen demand than would occur instream. The relationship between laboratory and in-stream COD is not well documented in the literature. In addition, the primary means of transport of organic chemicals to the stream is through storm water runoff, which tends to be highly oxygenated.”)

⁴²¹ TDD at 7-11.

⁴²² Notice at 44689, col. 3.

a. **Reason One: COD captures the oxygen demand from nitrogen and other organic components of the contaminated stormwater that may not be represented in a BOD5 analytical result.**

First, EPA provides no basis for making this claim and, in fact, can only say that the COD test “may” have this quality – it can also be accurately stated on the basis of the evidence in the record (none) that COD “may not” have this quality. Therefore, there is no basis for distinguishing it from BOD.

Second, EPA already is regulating separately for nitrogen. The Agency therefore has no need to avail itself of a measure of oxygen demand to “capture” nitrogen – certainly it provides no basis for elevating COD over BOD.

More importantly, if COD does in fact “capture oxygen demand from nitrogen” this weighs in favor of selection of BOD, not against it. A discharge limit for oxygen demand is being set to establish compliance with “aircraft deicing” BAT; that is, as standard for treatment of ADF. The record clearly establishes that Nitrogen is not associated with ADF, but rather pavement deicers. In this context, it is critical to point out that EPA is proposing a discharge limit on oxygen demand to apply exclusively to ADF. Proposed § 449.10(b), entitled “Treatment of collected runoff from aircraft deicing,” provides:

... any existing point source subject to this Part must achieve the numeric effluent limitations in Table I. These limitations must be met for all *ADF collected* pursuant to paragraphs (a) and (b) of this section.⁴²³

Both the referenced paragraphs (a) and (b) apply exclusively to ADF. So too, the referenced Table I identifies the proposed COD limit as the “pollutant or pollutant property” set to regulate the “aircraft deicing” wastestream. In contrast, the proposed limit for ammonia as nitrogen applies strictly to airfield pavement deicing.⁴²⁴ Thus, whether COD is the better “indicator pollutant (and the appropriate “regulated pollutant”) relates exclusively to the regulation of aircraft deicing and ADF not pavement deicing. As a result, if COD captures oxygen demand exerted by nitrogen while BOD does not, it is BOD, not COD that more accurately reflects whether the treatment standard for ADF is being met. In fact, EPA has provided no basis whatsoever for regulating nitrogen as a component of ADF – asserting that selection of COD will effectively do this merely establishes that EPA is seeking to regulate where it has provided absolutely no basis for doing so.

⁴²³ Proposed § 449.10(b) (emphasis added).

⁴²⁴ Proposed § 449.10(d) is entitled “Compliance alternative for airfield BAT requirements,” and provides: “*Airfield pavement discharges* must achieve the numeric limitations for ammonia in Table II.” Proposed § 449.10(d)(1) (emphasis added); Table II identifies the proposed ammonia as nitrogen limit as the “pollutant or pollutant property” set to regulate the “airfield pavement deicing” wastestream. See Notice at 44717, “Table II – BAT Limitations.”

This is precisely the problem with EPA's assertion that COD also captures "other organic components" not represented in the BOD result. Indeed, EPA has clearly stated that many such "organic components" are either affirmatively "beyond the scope of this regulation" and/or that the Agency has insufficient information upon which to base any regulation of these substances. In its Preamble, EPA states:

As described in Section VII.C, EPA identified 21 pollutants of concern that stem directly from airport deicing operations. EPA estimates, however, that many of these pollutants, such as metals, are generally present in airport stormwater discharges irrespective of deicing activities that are taking place. These pollutants would be also present in discharges at airports where no deicing takes place ***and as such are beyond the scope of today's proposed rule.***⁴²⁵

EPA itself acknowledges that "COD is a measure of the oxygen-consuming capacity *of inorganic* and organic matter present in water."⁴²⁶ Thus, EPA concedes that COD will measure oxygen demand exerted by the inorganic substances (*e.g.*, metals) and organic substances EPA affirmatively declares are "beyond the scope of the regulation." That COD measures oxygen demand exerted by these substances even though they are beyond the scope of the regulation establishes that COD must not be selected as the indicator pollutant.

Similarly, EPA acknowledges it does not have sufficient basis to regulate several organic substances associated with ADF. In Section 7.4 of its TDD, "Selection of Regulated Pollutants for Proposal," EPA states:

Table 7-2 lists the potential pollutants of concern identified in Section 7.3, along with an explanation of whether EPA selected the pollutant for regulation. Based on the documented environmental impacts from airport deicing runoff, EPA focused on regulating those pollutants exerting oxygen demand and contributing toxicity to receiving water bodies. EPA found that the impacts of slug loads of ADF stormwater on the dissolved oxygen of receiving streams, as well as color and odor issues associated with high ADF concentrations in stormwater discharge, are well documented. The main component of ADF is glycol, which exhibits significant oxygen demand. Research by Corsi (Corsi et al., 2006) also identified potential toxicity concerns that may be linked to ADF additives, specifically triazoles and alkylphenols. In conversations with ADF manufacturers, EPA has been told that the use of triazole compounds in ADF is being discontinued and that triazole use in European ADFs has been phased out. Alkylphenols and their ethoxylates have also been identified as potential toxic components of ADF. EPA's sampling data have confirmed the

⁴²⁵ Notice at 44689, col. 3 (emphasis added).

⁴²⁶ EIB at 2-14 (emphasis added).

presence of these compounds; however, ***EPA believes that insufficient information is currently available to fully characterize the extent to which these compounds are present in deicing stormwater and their impact.***⁴²⁷

Moreover, EPA makes clear that it absolutely intends to exclude such substances from the scope of the regulation:

While EPA has an understanding generally of ADF composition—*i.e.*, each product is a glycol-based compound with several additives— deicing fluid manufacturers did not provide us with information on specific ADF formulations. These manufacturers declined several requests to provide information on formulations, citing concerns about confidential business information. EPA has learned about a number of the additives, but not necessarily their concentration, from other sources. Because of incomplete information on these ADF additives, ***EPA is not proposing numeric effluent limits for any of these additives.***⁴²⁸

To the degree COD “captures” these substances while BOD does not (as EPA claims), EPA is doing precisely what it says it is not doing: setting an effluent limitation that applies to “these additives.” This weighs in favor of selecting BOD over COD, not the other way around.

We note that the referenced Table 7-2 lists the 21 “pollutants of concern” and identifies the “explanation of selection or non-selection of pollutant.” These substances can be placed in five categories:

- three substances that are associated exclusively with urea use (Ammonia-as-N, Nitrate/Nitrite and TKN);
- seven metals EPA for which EPA admits it has “limited impact data” and are not subject to BAT;
- six organic substances for which EPA admits it has “limited data available;”
- two parameters measuring oxygen demand (COD and BOD5); and
- three organic substances associated with ADF usage that are regulated using “COD as surrogate” (EG, PG and acetone).⁴²⁹

Thus there are only three substances upon which EPA claims to have both enough data to upon which to base a decision to regulate that are intended to be regulated by COD. Of these, the Record contains information regarding only PG and EG – it is devoid of any analysis regarding the amount of acetone associated with ADF usage. (We address acetone at length below.)

At bottom, the only non-indicator pollutants EPA asserts are both intended to be within the scope of this regulation and for which it has provided a sufficient basis for regulating are PG and EG. But if EPA makes one thing clear in this context it is that ***“both of these parameters***

⁴²⁷ TDD at 7-10 to 7-11 (emphasis added).

⁴²⁸ Notice at 44690.

⁴²⁹ TDD at 7-12, Table 7-2.

are good indicators of the glycol-based oxygen demand component of stormwater deicing.”⁴³⁰ That is, of the substances for which it has a basis for regulating via an “indicator pollutant” EPA concedes that there is absolutely no basis for selecting COD rather than BOD.

i. **Acetone is not associated with ADF usage and EPA is compelled to eliminate acetone as a pollutant of concern**

The information in the Record establishes that applying its own criteria EPA is compelled to eliminate acetone as a pollutant of concern. To our knowledge acetone has not been identified as a pollutant of concern in any airport permit and EPA’s own analyses concluded that acetone is not among the “pollutants of concern” identified in airport storm water pollution prevention plans (“SWPPP”)⁴³¹ or substances with numeric limits in NPDES permits.⁴³² Acetone is a common solvent and is widely used at aviation maintenance facilities.⁴³³ At DIA, for example, “[m]aintenance of aircraft, vehicles and GSE is another industrial activity occurring widely at the Airport” and, while measures are in place to minimize runoff from such operations, DIA acknowledges that “[w]hen valves are positioned in collection mode at certain locations, residual material may be collected into the DIW [deicing waste] stormwater system.”⁴³⁴ The Record includes water quality studies involving discharges from airports that indicate that acetone is not a contaminant related to that source.⁴³⁵ Also, there is nothing in the Record that supports any direct association of acetone with use of ADF. To the contrary, an in-depth study of ADF components by the Airport Cooperative Research Program (a study EPA characterizes as

⁴³⁰ TDD at 7-11 (emphasis added), EIB at 3-6 (“Five-day biological oxygen demand (BOD5) is another parameter that can be used to monitor oxygen demand.”)

⁴³¹ Document – 0687.

⁴³² Document – 0686.

⁴³³ See, e.g., *Hazardous Chemicals in the Aviation Workplace* in FAA Aviation News at 8 (January / February 2001) (“Among the most widely encountered hazardous chemicals in aviation maintenance facilities are acetone”).

⁴³⁴ CDM, Denver International Airport – Stormwater Management Plan at 2-7 (August 2004).

⁴³⁵ See Document - 0949 at 237, *Biological and Water Quality Study of the Stillwater River Watershed* (November 6, 2001) (“Acetone was detected in 21% (6/29) of sediment samples, including some sites listed as having no quantifiable organic contamination. This chemical is used to clean sampling equipment and **is a residual from cleaning and not considered being in the environment**”) (emphasis added); Document - 0948 at 240, *Biological and Water Quality Study of the Little Miami River Basin, 1998* (June 21, 2000) (“Acetone was detected in 29% (18/63) of sediment samples including some sites listed as having no quantifiable organic contamination. This chemical is used to clean sampling equipment and is a residual from cleaning and **not considered being in the environment**”) (emphasis added); Document - 0947 at 4, *Biological and Water Quality Study of the Big Walnut Creek Basin 2000* (November 26, 2003) (“The ‘Columbus Airport Tributary’ was impacted by channelization, removal of the woody riparian corridor, runoff from Port Columbus International Airport including the persistent spillage of large quantities of airplane deicing solution (ethylene glycol), and sediment contamination (metals, PAHs)”; acetone detected in sediments at levels not exceeding Threshold Effect Concentration or Probable Effect Concentration).

“contain[ing] significant additional information on airport deicing products”⁴³⁶) does not identify acetone as a potential ingredient.⁴³⁷ The Agency itself reviewed over 20 scientific articles examining the content of ADF, but did not list acetone among “the chemicals for which EPA found some evidence of use in airport deicing product formulations.”⁴³⁸ The Agency also did not identify acetone as a potential ingredient when it conducted its assessment of ADF components in its *Preliminary Data Study – Airport Deicing Operations*.⁴³⁹ Moreover, were acetone a component of ADF, its presence would be positively correlated with the presence of PG in stormwater – instead the data shows the opposite: the higher the concentration of PG, the lower the observed concentration of acetone.⁴⁴⁰ ADF manufacturers perform strict quality control testing of ADF – the presence of acetone at significant levels would be considered inconsistent with quality standards.⁴⁴¹ In addition, ADF manufacturers take measures to ensure solvents or other contaminants do not affect ADF in transport – trucks are generally dedicated to transport of ADF only and cleaned with water or steam; pre-loading inspections require tanks, valves, pumps and hoses to be “clean, dry and odor free.”⁴⁴²

The only possible indication that acetone is associated with ADF is a single sample taken from an ADF airline deicing truck during the Agency’s sampling episode at DTW. The Final Sampling Episode Report cites detection of acetone in “Northwest Type I ADF” at the extremely low concentration of 704 ug/L.⁴⁴³ A sample of the same fluid type taken on the same day at the same airport from a fixed-base operator’s (“FBO’s”) ADF storage tank using different procedures to prevent sample contamination returned a “non-detect” result for acetone. The other samples of ADF taken by EPA – also of Northwest’s ADF – also came back non-detect for

⁴³⁶ EIB at 2-1.

⁴³⁷ Document - 1118 at 2-2 to 2-10 (ACRP Project 02-01, Aircraft Deicing and Airfield Anti-Icing Formulations: Aquatic Toxicity and Biochemical Oxygen Demand, *Contractor’s Phase I Interim Report for ACRP Project 02-01 Submitted November 2008*).

⁴³⁸ EIB at 2-4 and Table 2-2.

⁴³⁹ Document – 0107 at 9-10 to 9-14.

⁴⁴⁰

Document	Airport	Acetone (ug/L)	PG (mg/L)	Sampling Point
-0731	ALB	15400	2600	Ave Influent to AFB
-0689	MSP	23700	8600	Low Strength Tank
-0730	PIT	10900	15800	Influent to RO System
-0729	DIA	4100	173500	Influent to MVR System
-0688	DTW	3340	181000	SP-1 Frac Tank
-0689	MSP	1440	193000	High Strength Tank

⁴⁴¹ ATA communication with various ADF manufacturers, including Dow Chemical and Octagon.

⁴⁴² Octagon Process, *Tank Truck Loading Report* (Attachment 3).

⁴⁴³ Document - 0688 at 5-5.

acetone, indicating that the acetone identified in the single sample was an anomaly.⁴⁴⁴ Further, EPA's consultant (Eastern Research Group or "ERG") details the differences in the procedures used to collect the DTW samples:

A sample of Northwest's Type I ADF (SPF-3) was collected directly from a deicing truck as a grab-composite sample. The ADF was diluted by airline personnel to an ADF concentration of approximately 50 percent. The samples were collected by discharging the deicing fluid from the nozzle of the deicing vehicle into a composite jar (10-litre pickle jar). The composite jar was then used to fill the individual sample bottles.⁴⁴⁵

...

The FBO's Type I ADF (SP-7) was collected as a grab-composite sample from the FBO's ADF storage tank. The Type I ADF, a viscous, slippery, gold-colored liquid was collected by transferring the liquid from the tank through a hose into the 10-litre glass compositing jar. The FBO directed ERG to collect the ADF fluid from the hose rather than directly from the tank to avoid EPA/ERG from potentially contaminating the concentrated fluid with the sampling equipment. A valve on the hose was operated by FBO personnel to fill the 10-litre glass compositing jar. Individual sample bottles were filled with concentrated ADF from the 10-liter glass composite jar.⁴⁴⁶

While there was ample opportunity for contamination of the Northwest sample (#66116) – for example, acetone may have been used to clean the nozzles – this possibility was avoided during collection of the FBO sample (#66120). In addition, the laboratory acknowledges that the Northwest sample (#66116) was not analyzed consistent with applicable method (Method 1625C) – specifically, it was “not analyzed neat (undiluted) because the sample extracts would not concentrate to the method-specified 1-mL extract volume” and instead “the results from [a] 10 mL sample volume were reported by the laboratory.”⁴⁴⁷ In any event, even if valid, the single

⁴⁴⁴ Document – 0689, Table 5-4.

⁴⁴⁵ Document - 0688 at 3-2.

⁴⁴⁶ Document - 0688 at 3-2.

⁴⁴⁷ Document - 0688 at Appendix C. Analysis of the FBO sample (which is of the same fluid type in which acetone was detected) also differed greatly:

According to the laboratory narrative, sample 66120 was highly viscous and difficult to purge. Acetone and acrolein were detected in the neat analysis, however, due to low internal standard recoveries, a 10-fold dilution was performed. The laboratory reported the results for this sample from the 10-fold dilution. Neither acetone nor acrolein were above the ML in the analysis and the non-detect results for those analytes are reported on the database at the ML, adjusted for the dilution.

Document 0688 at Appendix C.

detection of ADF at a concentration of 740 ug/mL could not possibly support the conclusion that acetone in ADF is present in large enough quantities to account for the levels detected in untreated stormwater samples.

In sum, acetone clearly is “from a source other than deicing/anti-icing chemical,” thus failing one of EPA’s criteria for selecting a substance as a pollutant of concern.⁴⁴⁸ EPA also identifies the following as a selection criterion: “Whether the pollutant is discharged in relatively small amounts and/or is likely to cause toxic effects.”⁴⁴⁹ Clearly, the substance is present in relatively small amounts and, in fact, is not present at all as a substance related to the activity EPA proposes to regulate. In addition, EPA concedes that acetone “has low toxicity” – indeed EPA concludes acetone has a lower “toxic weighting factor” than calcium.⁴⁵⁰

b. **Reason Two: Toxic aircraft deicing fluid additive compounds in deicing stormwater may have a negative and variable impact on the acclimation of the active cultures used in BOD5 analysis, making that method less accurate than a COD analysis.**

This is contradicted by the widespread use of BOD in favor of COD to monitor stormwater contamination pursuant to NPDES permits. In addition, as stated above, EPA’s conclusion that it is possible to derive an “industry-specific” COD/BOD ratio establishes that any supposed effect of toxicity on BOD testing can be overcome through proper analysis.

⁴⁴⁸ TDD at 7-8.

⁴⁴⁹ TDD at 7-8, Notice at 44688, col. 3 and at 44689, col. 1:

EPA shortened the list of pollutants to those that were directly associated with aircraft deicing. This was done by reviewing information provided by experts and excluding pollutants that were thought to be associated with one of the following sources: source water; aircraft and vehicle fueling operations; maintenance-related operations, or runoff from building roofs. Having identified pollutants that are present in airport deicing stormwater, the Agency next needed to consider which pollutants should be controlled. EPA did not consider a pollutant as a potential pollutant of concern if it possesses the following characteristics:

- The pollutant is present in the deicing stormwater from a source other than deicing chemical use;
- The pollutant is discharged in relatively small amounts and is neither causing nor likely to cause toxic effects;
- The pollutant is detected in the effluent from only a small number of airports and is uniquely related to those facilities; or
- The pollutant cannot be analyzed by EPA-approved or other established methods.

⁴⁵⁰ Document - 0733 at 13.

- c. **Reason Three: COD analyses are simple to conduct and can be measured in real time, compared to the 5-day test required by the BOD5 analytical method.**

First, this is not a proper reason for selecting COD over BOD – it is a matter of analytical convenience, not analytical accuracy. In any event, the Record establishes that the use of automated, real-time meters to measure BOD are used and accepted in the field. The Water Quality Monitoring Plan for NPDES permit at PDX actually requires use of these meters and that laboratory results will not be used to monitor BOD levels to ascertain compliance with BOD limits.⁴⁵¹ EPA visited PDX and noted the use of the automated BOD meters.⁴⁵² Simply put, with present technology there is no basis for selecting COD over BOD as a matter of sampling/analytic convenience.

- d. **Reason Four: The COD analytical method does not require measurement of the receiving water temperature.**⁴⁵³

EPA's fourth reason – that the COD analytical method does not require measurement of the receiving water temperature – may be true, but again speaks to convenience not relative efficacy of the tests. Further, EPA method 405.1 for BOD (5-days) specifies that the test be conducted at 20C. This temperature requirement is unrelated to the receiving water temperature. However, since the oxygen demand of organic constituents is a function of water temperature, the BOD test, not the COD test, is well suited to account for and address the temperature dependency of biological oxygen demand. Moreover, the record establishes that EPA's concern.

C. **EPA Fails to Determine “Availability” and “Economic Achievability” of Technologies Designated as BAT**

As set forth in detail elsewhere in these Comments, EPA's determination that CDPs are “available” is arbitrary and capricious. Therefore, it has failed as a legal matter to make the statutorily required determination. More fundamentally, even if its determination of “availability” were grounded in defensible analysis, the determination is insufficient as a legal matter. EPA summarizes its conclusions regarding the availability of deicing pads as follows:

Based on the limited data available, it appears LGA, DCA and JFK airports have sufficient space available near the ends of runways to install aircraft deicing pads. Although the actual deicing pad

⁴⁵¹ Document – 0184 at 2-11 and 2-12 (Water quality *will be monitored through automated meter readings used to monitor BOD concentrations*, as described below, with the exception of grab samples at selected outfalls . . . The BOD readings *will be* recorded from those outfalls equipped with automated meters (outfalls 002, 004, 006, 007, and eventually 01N and 01S). *No grab samples will be* collected from these outfalls for BOD5 laboratory analysis; . . . Automated meters *will be used* to monitor BOD concentrations at outfalls 002, 004, 006, 007, and eventually outfalls 01N and 01S. Grab samples for BOD5 laboratory analysis *will not be collected* from outfalls with automated BOD meters.”) (emphasis added).

⁴⁵² Document - 0510 at A-3.

⁴⁵³ Notice at 44689-90.

locations and configurations would likely vary from those presented in this memorandum, the analysis *indicates* that even space limited airports can install some combination of deicing pads as one option *to help achieve* the target capture and control percentages for spent ADF.⁴⁵⁴

This is not legally sufficient to support its determination that CDPs are “available” in the sense required to support a designation as BAT. First of all, BAT for ADF collection is articulated as a “bright line” standard: subject airports must collect 60% of available ADF⁴⁵⁵ - subject airports are required to deploy technology that does achieve the standard. Secondly, EPA repeatedly states that CDPs – operating without “help” of other technologies – do achieve the BAT standard⁴⁵⁶ and deems CDPs operated “in accordance with . . . technical specifications” set forth in proposed § 449.20(b)(1)(ii) as “sufficient to demonstrate compliance with a requirement to collect at least 60 percent of the available ADF.” In addition, in meetings with EPA, EPA officials orally conformed that the record does not contain any analysis or attempt to establish that the 60% collection standard can be met through any means other than CDPs, specifically including use of pads in combination with other technologies.⁴⁵⁷ Finally, EPA’s methodology for estimating costs of compliance with the Proposed Rule clearly establishes that the Agency designated CDPs as the sole means used by large airports to meet the 60% collection requirement.

In the context of this proposed Rule, the “availability” of technology to meet BAT for ADF collection at large airports means the “availability” of CDPs. The self-identified lynchpin of its decision to designate CDPs as BAT for collection of ADF at large airports – by its own terms – establishes only that pads may be available to “help achieve” the BAT standard. Judged by its very own terms, EPA’s analysis is thus insufficient to fully its legal requirement to determine pads are available.

EPA must determine economic achievability of rule for airlines as well as airports. In order to do this, it must properly (both methodologically and empirically) determine the cost of compliance with the Proposed Rule. In addition, EPA must separately establish the economic achievability of its proposed BAT for ADF and PDF, and not attempt to justify one with pollutant removals attributable solely to the other.

⁴⁵⁴ EPA-HQ-OW-2004-0038-1171 at 3 (emphasis added).

⁴⁵⁵ Proposed §449.10(a).

⁴⁵⁶ Notice at 44686 (EPA estimates that central deicing pads allow airports to capture about 60% of the available ADF); Notice at 44691 (“[O]f the 14 airports that would have to meet the 60 percent ADF collection requirement in this proposal, seven already have installed deicing pads that would capture at least 60 percent of the ADF”); Notice at 44691 (“This collection requirement is based on the estimated performance of centralized deicing pads”).

⁴⁵⁷ Statement of Brian D’Amico, EPA at meeting with Industry Representatives, September 22, 2009.

D. EPA Impermissibly Mandates Technologies

The Proposed Rule impermissibly mandates the use of specific collection technologies, both by making the use of CDPs for 100% of departures at Tier One airports the only means of compliance and by authorizing permit writers to dictate collection technologies, the form by which a permittee may demonstrate compliance with applicable collection standards, and the availability of credit for pollution prevention practices. It also fails to establish whether use of urea is ever possible. Rather, it takes credit for elimination of 100% of the ammonia attributable to urea use, suggesting that product substitution – the proposed BAT for pavement deicers, is in fact a mandated technology because the compliance alternative of treating for Ammonia-N is cost-prohibitive.

E. EPA Impermissibly Delegates Authority to Permit Writers

The Proposed Rule impermissibly authorizes permit writers to dictate collection technologies, the form by which a permittee may demonstrate compliance with applicable collection standards, and the availability of credit for pollution prevention practices.

F. EPA Fails to Provide Proper Notice

EPA's description of its analysis does not match the analysis that EPA in fact did. This amounts to saying one thing and doing another. While the deviations in analysis from the description EPA provides likely reflect mathematical and other errors, the fact remains that EPA's description of its analysis does not match the analysis it conducted. This amounts to a failure to notify the public adequately of the underlying rationale for its decision.

In addition, the Proposed Rule fails to identify the means by which EPA reached conclusions that are the basis of the Proposed Rule, including, without limitation, its conclusions as to the expected performance of model technologies and its costing of those technologies.

G. EPA Impermissibly Establishes an Effluent Limitation for Ammonia-N

The limit on ammonia as nitrogen is not the BAT for airfield pavement deicing. Rather, the identified BAT is substitution of urea as a pavement deicer.

[F]or airfield pavement deicers, EPA is proposing to identify a BAT of discontinuing use of urea-based pavement deicers in favor of alternative, less toxic products that are not harmful to aircraft. Thus, BAT would be based on product substitution rather than treatment of the wastestream that runs off of airfield pavements.⁴⁵⁸

EPA asserts in the Notice that the Ammonia-N limit is intended to facilitate the “compliance alternative” of continued use of urea.

⁴⁵⁸ Notice at 44693, col. 1.

While EPA is proposing to identify product substitution as BAT, in order to allow flexibility to regulated facilities, the Agency is also proposing a compliance alternative to the certification requirement. This provision would accommodate facilities that might wish to continue using urea-based deicers and install treatment to eliminate urea-based ammonia discharges instead.⁴⁵⁹

Proposed §449.10(d) is styled as establishing a “compliance alternative for airfield BAT requirements,” allowing airports at which (all) “airfield pavement discharges” meet the Ammonia-N limit to be deemed to meet the urea ban.

The TDD reflects anything but an intent to provide “flexibility.”

Ammonia as N is proposed for regulation *to ensure that airports cease using urea as an airfield deicer*, since other less toxic products are available.⁴⁶⁰

. . . Facilities that elect to comply using the compliance alternative would be required to monitor and comply with a proposed ammonia limit. To establish the proposed compliance alternative limitation for ammonia, the Agency had to take into account the ammonia that is a by-product of an AFB wastewater treatment system. This is because AFB discharges could have higher ammonia concentrations than that of background levels found in airfield runoff. While this results in a proposed compliance alternative ammonia effluent limit higher than concentrations in airfield runoff where AFB technologies are not used, the Agency estimates that these concentrations are lower than those from airfield pavement discharges where urea-based deicers are used.⁴⁶¹

Thus, Ammonia-as-Nitrogen has nothing to do with BAT. Indeed, EPA has affirmed that it has not done analysis to determine the costs, load reductions, or other items associated with following the “compliance alternative” – *i.e.*, electing to continue use of urea, but meeting the Ammonia-as-N effluent limit. What information is provided in the Record EPA says indicates that as practical matter it is impossible to demonstrate compliance with the Ammonia-N standard with respect to pavement runoff only⁴⁶² and that “the costs associated with capturing and treating these wastestreams would be prohibitively high.”⁴⁶³

⁴⁵⁹ Notice at 44680, col. 2

⁴⁶⁰ TDD at 7-11 (emphasis added).

⁴⁶¹ Proposed § 448.10(c); *see* Notice at 44680, col. 2, Table IV-1 – SUMMARY OF PROPOSED AIRPORT DEICING EFFLUENT LIMITATION GUIDELINES AND STANDARDS.

⁴⁶² Notice at 44693, col. 2.

⁴⁶³ Notice at 44693, col. 2.

APPENDIX A

Summary of Proposed Rule

EPA proposes to establish requirements for controlling water pollution related to aircraft and pavement deicing activities at airports. In the most general terms, EPA establishes three types of requirements that apply in different respects to four categories of airports.

Applicability

The Proposed Rule applies only to “Primary Airports,” as defined in 49 U.S.C. § 47102(15)⁴⁶⁴ “with at least 1,000 annual scheduled commercial air carrier jet departures.” As discussed below, different requirements apply depending on the number of “annual departures.” Thus, to determine whether and what requirements apply at a specific airport, airports (and air carriers) will need to determine both the number of “annual scheduled commercial air carrier jet departures” and the number of “annual departures” at any given station. In the Notice, EPA explains that the “determination of the annual number of departures” is to be based on data collected by the Bureau of Transportation Statistics (BTS) and “compiled in the BTS T-100 database.”⁴⁶⁵

The applicability of certain requirements also is a function of the “annual normalized ADF usage.”⁴⁶⁶ While its precise meaning is unclear, EPA defines “normalized aircraft deicing fluid” as “ADF less any water added by the manufacturer or customer before ADF application.”⁴⁶⁷ Using these parameters (departure levels and ADF usage levels), airports can be separated into four categories or tiers:

	Departures		Annual ADF Usage
	Jet	All	
Tier One	1,000 or more annual scheduled commercial air carrier jet departures	10,000 or greater annual departures	460,000 gallons or greater
Tier Two		Less than 10,000 annual departures	less than 460,000 gallons
Tier Three			
Tier Four	Less than 1,000 annual scheduled commercial air carrier jet departures		

When determining whether the thresholds for departure levels and ADF usage are met, they are “calculated over the five-year period prior to submittal of a permit application or Notice of Intent [NOI].”⁴⁶⁸

⁴⁶⁴ See Proposed §§ 449.1 and 449.2.

⁴⁶⁵ Notice at 44700.

⁴⁶⁶ EPA also should, for the sake of clarity, state explicitly that the applicability of any requirements to a given airport is not determined by the ADF usage estimates the Agency derived for and used to analyze the impacts of the Proposed Rule.

⁴⁶⁷ EPA should confirm that “ADF” as used in the Proposed Rule denotes the glycol fraction of commercial deicing products.

⁴⁶⁸ See Proposed § 449.2

Best Available Technology (BAT) Requirements

The Proposed Rule would only establish BAT requirements for the industry – there are three types of requirements: (1) standards for collection of ADF, (2) standards for use of urea as a pavement deicer, and (3) treatment of effluent collected at airports.

Requirements for Collection of ADF

All Tier One and Tier Two airports must meet specified standards for collection of ADF. The standards are articulated as collection of “Available ADF,” which EPA defines as “80 percent of the sprayed deicing fluid and 10 percent of the sprayed anti-icing fluid.”⁴⁶⁹

Tier One airports “must collect at least 60 percent” and Tier Two airports “must collect at least 20 percent” of available ADF.⁴⁷⁰ Tier Three and Tier Four airports are not subject to ADF collection (or treatment) requirements. Tier One and Tier Two airports also must meet BAT for treatment of ADF.

Requirements for Pavement Deicing

All Tier One, Tier Two and Tier Three airports must either certify that they do not use urea for airport pavement deicing or, if they choose to continue use of urea, they must meet the effluent limit for ammonia-as-nitrogen (ammonia is a byproduct of urea).⁴⁷¹ For an airport that chooses to maintain usage of urea as a pavement deicer, all “airfield pavement discharges must achieve the numeric limitations for ammonia,” which is defined as a maximum daily concentration of Ammonia as Nitrogen (Ammonia-N) of 14.7 milligrams per liter (mg/L).⁴⁷²

In effect, this means that airports choosing to maintain urea usage are required to collect 100% of urea used and treat it to meet the standard.

New Source Performance Standards

The Proposed Rule defines “new source” as “any Primary Airport constructed after rule promulgation; and any new runway constructed at a Primary Airport, the deicing operations associated with the departures on the runway and the deicing of paved surfaces associated with the new runway.”⁴⁷³ For ADF, new sources with at least 10,000 departures are required Tier One

⁴⁶⁹ See Proposed § 449.2 (definition of “Available ADF”). EPA defines “*Aircraft deicing fluid (ADF)*” as “a fluid applied to aircraft to remove or prevent any accumulation of snow or ice on the aircraft. This includes deicing and anti-icing fluids.” EPA indicates elsewhere that it intends “deicing fluid” to refer to “Type I” and Type II” ADF and “anti-icing fluid” to refer to “Type IV” ADF.

⁴⁷⁰ See Proposed § 449.10(a) and § 449.10 (b).

⁴⁷¹ See Proposed § 449.10(c) and §449.10(d).

⁴⁷² See Proposed § 449.10(d)(1).

⁴⁷³ See Proposed § 449.2.

60% collection and treatment requirements.⁴⁷⁴ The same PDF requirements apply to new sources as apply to existing sources.

Summary and Nomenclature Used in These Comments

The following summarizes the nomenclature we will use to refer to various categories of airports and our understanding of the relevant thresholds:

“Tier One Airports” - We will use these terms to refer to airports that meet the following thresholds:

- Departures: 1,000 or more annual scheduled commercial air carrier jet departures; 10,000 or more annual departures
- ADF Usage: 460,000 gallons or more of “normalized ADF” on an annual basis

“Tier Two Airports” - We will use these terms to refer to airports that meet the following thresholds:

- Departures: Same as Tier One
- ADF Usage: Less than 460,000 gallons of “normalized ADF” on an annual basis

“Tier Three Airports” - We will use these terms to refer to airports that meet the following thresholds:

- Departures: 1,000 or more annual scheduled commercial air carrier jet departures, but less than 10,000 annual departures
- ADF Usage: N/A

“Tier Four Airports” - We will use these terms to refer to airports that meet the following thresholds:

- Departures: Less than 1,000 annual scheduled commercial air carrier jet departures, and less than 10,000 annual departures
- ADF Usage: N/A
- Collection and Treatment of PDF: None

⁴⁷⁴ See Proposed §449.11.

APPENDIX B
U.S. Airports Codes

Airport Code	Airport	City	State
ABQ	Albuquerque Intl Sunport	Albuquerque	NM
ABR	Aberdeen Regional	Aberdeen	SD
AFW	Fort Worth Alliance	Fort Worth	TX
ALB	Albany Intl	Albany	NY
ALO	Waterloo Muni	Waterloo	IA
ANC	Ted Stevens Anchorage Intl	Anchorage	AK
ANI	Aniak	Aniak	AK
ASE	Aspen-Pitkin Co/Sardy Field	Aspen	CO
ATL	Hartsfield - Jackson Atlanta Intl	Atlanta	GA
ATW	Outagamie County Regional	Appleton	WI
AUS	Austin-Bergstrom Intl	Austin	TX
AVP	Wilkes-Barre/Scranton Intl	Wilkes-Barre/Scranton	PA
AZO	Kalamazoo/Battle Creek International	Kalamazoo	MI
BDL	Bradley Intl	Windsor Locks	CT
BET	Bethel	Bethel	AK
BFI	Boeing Field/King County Intl	Seattle	WA
BHM	Birmingham Intl	Birmingham	AL
BIS	Bismarck Muni	Bismarck	ND
BNA	Nashville Intl	Nashville	TN
BOI	Boise Air Terminal/Gowen Fld	Boise	ID
BOS	General Edward Lawrence Logan Intl	Boston	MA
BRW	Wiley Post-Will Rogers Mem	Barrow	AK
BTM	Bert Mooney	Butte	MT
BUF	Buffalo Niagara Intl	Buffalo	NY
BUR	Bob Hope	Burbank	CA
BWI	Baltimore-Washington Intl	Baltimore	MD
CAK	Akron-Canton Regional	Akron	OH
CDB	Cold Bay	Cold Bay	AK
CHA	Lovell Field	Chattanooga	TN
CLE	Cleveland-Hopkins Intl	Cleveland	OH
CLT	Charlotte/Douglas Intl	Charlotte	NC
CMH	Port Columbus Intl	Columbus	OH
COS	City of Colorado Springs Muni	Colorado Springs	CO
CRW	Yeager	Charleston	WV
CVG	Cincinnati/Northern Kentucky Intl	Covington	KY
CWA	Central Wisconsin	Mosinee	WI
DAL	Dallas Love Field	Dallas	TX
DAY	James M Cox Dayton Intl	Dayton	OH
DCA	Ronald Reagan Washington National	Washington	DC
DEN	Denver Intl	Denver	CO
DFW	Dallas/Fort Worth International	Dallas-Fort Worth	TX
DLH	Duluth Intl	Duluth	MN

DSM	Des Moines Intl	Des Moines	IA
DTW	Detroit Metropolitan Wayne County	Detroit	MI
EAU	Chippewa Valley Regional	Eau Claire	WI
ELP	El Paso Intl	El Paso	TX
EVV	Evansville Regional	Evansville	IN
EWN	Craven County Regional	New Bern	NC
EWR	Newark Liberty Intl	Newark	NJ
FAI	Fairbanks Intl	Fairbanks	AK
FCA	Glacier Park Intl	Kalispell	MT
FLL	Fort Lauderdale/Hollywood Intl	Fort Lauderdale	FL
FWA	Fort Wayne International	Fort Wayne	IN
GCC	Gillette-Campbell County	Gillette	WY
GEG	Spokane Intl	Spokane	WA
GPT	Gulfport-Biloxi Intl	Gulfport	MS
GRB	Austin Straubel International	Green Bay	WI
GRR	Gerald R. Ford International	Grand Rapids	MI
GSO	Piedmont Triad International	Greensboro	NC
HLN	Helena Regional	Helena	MT
HNL	Honolulu Intl	Honolulu	HI
HOU	William P Hobby	Houston	TX
HTS	Tri-State/Milton J. Ferguson Field	Huntington	WV
HVN	Tweed-New Haven	New Haven	CT
HYA	Barnstable Muni-Boardman/Polando Field	Hyannis	MA
IAD	Washington Dulles International	Washington	DC
IAH	George Bush Intercontinental Arpt/Houston	Houston	TX
ILM	Wilmington Intl	Wilmington	NC
ILN	Airborne Airpark	Wilmington	OH
IND	Indianapolis Intl	Indianapolis	IN
INL	Falls Intl	International Falls	MN
IPT	Williamsport Rgnl	Williamsport	PA
ISP	Long Island Mac Arthur	Islip	NY
JAC	Jackson Hole	Jackson	WY
JAX	Jacksonville Intl	Jacksonville	FL
JFK	John F Kennedy Intl	New York	NY
JNU	Juneau Intl	Juneau	AK
KOA	Kona Intl at Keahole	Kailua/Kona	HI
KTN	Ketchikan Intl	Ketchikan	AK
LAS	Mc Carran Intl	Las Vegas	NV
LAX	Los Angeles Intl	Los Angeles	CA
LCK	Rickenbacker International	Columbus	OH
LFT	Lafayette Regional	Lafayette	LA
LGA	La Guardia	New York	NY
LNK	Lanai	Lanai City	HI
LWS	Lewiston-Nez Perce County	Lewiston	ID

MCI	Kansas City Intl	Kansas City	MO
MCO	Orlando Intl	Orlando	FL
MDW	Chicago Midway Intl	Chicago	IL
MEM	Memphis Intl	Memphis	TN
MGM	Montgomery Rgnl (Dannelly Field)	Montgomery	AL
MHR	Sacramento Mather	Sacramento	CA
MHT	Manchester	Manchester	NH
MIA	Miami Intl	Miami	FL
MKE	General Mitchell International	Milwaukee	WI
MSP	Minneapolis-St Paul Intl/Wold-Chamberlain	Minneapolis	MN
MSY	Louis Armstrong New Orleans Intl	New Orleans	LA
MWA	Williamson County Regional	Marion	IL
OAK	Metropolitan Oakland Intl	Oakland	CA
OGG	Kahului	Kahului	HI
OKC	Will Rogers World	Oklahoma City	OK
OMA	Eppley Airfield	Omaha	NE
OME	Nome	Nome	AK
ONT	Ontario Intl	Ontario	CA
ORD	Chicago O'Hare Intl	Chicago	IL
ORF	Norfolk Intl	Norfolk	VA
OTZ	Ralph Wien Memorial	Kotzebue	AK
PBI	Palm Beach Intl	West Palm Beach	FL
PDX	Portland Intl	Portland	OR
PHL	Philadelphia Intl	Philadelphia	PA
PHX	Phoenix Sky Harbor Intl	Phoenix	AZ
PIT	Pittsburgh International	Pittsburgh	PA
PNS	Pensacola Regional	Pensacola	FL
PVD	Theodore Francis Green State	Providence	RI
RAP	Rapid City Regional	Rapid City	SD
RDD	Redding Muni	Redding	CA
RDM	Roberts Field	Redmond	OR
RDU	Raleigh-Durham Intl	Raleigh/Durham	NC
RFD	Greater Rockford	Rockford	IL
RIC	Richmond International	Richmond	VA
RNO	Reno/Tahoe International	Reno	NV
ROA	Roanoke Regional/Woodrum Field	Roanoke	VA
ROC	Greater Rochester International	Rochester	NY
RST	Rochester International	Rochester	MN
RSW	Southwest Florida Intl	Fort Myers	FL
SAF	Santa Fe Muni	Santa Fe	NM
SAN	San Diego Intl	San Diego	CA
SAT	San Antonio Intl	San Antonio	TX
SBN	South Bend Regional	South Bend	IN
SCC	Deadhorse	Deadhorse	AK
SDF	Louisville Intl-Standiford Field	Louisville	KY

SEA	Seattle-Tacoma Intl	Seattle	WA
SFO	San Francisco International	San Francisco	CA
SGU	St George Muni	St George	UT
SIT	Sitka Rocky Gutierrez	Sitka	AK
SJC	Norman Y. Mineta San Jose International	San Jose	CA
SJU	Luis Munoz Marin Intl	San Juan	PR
SLC	Salt Lake City Intl	Salt Lake City	UT
SMF	Sacramento International	Sacramento	CA
SMX	Santa Maria Pub/Capt G Allan Hancock Fld	Santa Maria	CA
SNA	John Wayne Airport-Orange County	Santa Ana	CA
SRQ	Sarasota/Bradenton Intl	Sarasota/Bradenton	FL
STL	Lambert-St Louis Intl	St Louis	MO
SWF	Stewart Intl	Newburgh	NY
SYR	Syracuse Hancock Intl	Syracuse	NY
TOL	Toledo Express	Toledo	OH
TPA	Tampa Intl	Tampa	FL
TTN	Trenton Mercer	Trenton	NJ
TUP	Tupelo Rgnl	Tupelo	MS
TUS	Tucson Intl	Tucson	AZ
TVC	Cherry Capital	Traverse City	MI
XNA	Northwest Arkansas Rgnl	Fayetteville/Springdale	AR
YIP	Willow Run	Detroit	MI



ATTACHMENT 1

End of Runway Deicing Program

ID	Task Name	Total Cost	2009			2010				2011				2012				2013				2014				2015			
			Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
1	T/W L Deicing Pad - Phase 1	\$23,000,000																											
2	T/W L Deicing Pad - Phase 2	\$24,150,000																											
3	T/W L Support Facility	\$6,411,000																											
4	R/W 34L Deicing Pad - Phase 1	\$21,425,000																											
5	R/W 34L Deicing Pad - Phase 2	\$22,218,000																											
6	R/W 34L Support Facility	\$6,923,000																											
7	North Cargo Apron Expansion	\$25,503,000																											
8	New North Cargo Building	\$17,260,000																											
9	R/W 34R Deicing Pad - Phase 1	\$26,680,000																											
10	R/W 34R Deicing Pad - Phase 2	\$27,945,000																											



Design



Bid & Award



Construction



ATTACHMENT 2



PDX DEICING CONVEYANCE & TREATMENT SYSTEM ENHANCEMENT COLLECTION & CONVEYANCE TO STORAGE

MF 2004	CSI Description:	Qty	U/M	Unit Price	Total	Comments:
	Pipe Relocation	1	LS	375,000.00	375,000	ALLOWANCE
	DIVISION TOTAL				375,000	
02 21 13	Survey	433	CH	174.08	75,432	
02 71 00	Dewatering @ Pump Stations	2	EA	113,207.61	226,415	PS N & S
	Environmental Inspector		MH	71.79	-	Port to provide as required.
	Sheet Pile to Protect Excavations	1,746	SF	47.44	82,826	PS N & S
	Existing Condition Costs	1	LS	670,789.40	670,789	
	Clean Offsite Public Streets	7	MO	4,218.18	29,527	
	Demo Existing Slab @ PS I	618	SF	13.54	8,368	
31 23 16	Excavation	1,348	CY	46.11	62,160	PS N & S
	Backfill PS w/Import	723	CY	39.92	28,845	PS N & S
	Fill to Provide 3 ft Cover	1,222	CY	10.90	13,322	
32 02 00	Turf and Grasses	169,020	SF	0.71	119,201	
32 11 16	Temp Road for Pipe Installation	169,020	SF	3.73	630,720	12" rock on fabric-In and Out
	Dewater @ Pipe Route	7,810	LF	19.33	150,976	
33 31 16	Industrial Waste Utility Sewerage Piping					
	Mobilize Site	1	LS	238,620.90	238,621	
	6", 26" & 28" HDPE	8,120	LF	145.27	1,179,612	Common trench Add trace wire
	26" HDPE Pipe	470	LF	90.72	42,638	Add trace wire
	28" HDPE Pipe	800	LF	95.76	76,608	Add trace wire
	20" HDPE Pipe		LF	-	-	
	32" HDPE Pipe		LF	-	-	



PDX DEICING CONVEYANCE & TREATMENT SYSTEM ENHANCEMENT COLLECTION & CONVEYANCE TO STORAGE

MF 2004	CSI Description:	Qty	U/M	Unit Price	Total	Comments:
	DIVISION TOTAL				3,636,062	
	Misc Hoisting	4	MO	4,702.50	18,810	
03 21 00	Reinforcing Steel	68,250	LB	0.97	66,134	
	Equip Housekeeping Pads		SF			Included
	P/C Conc Manhole @ PS S	1	EA	27,931.78	27,932	Based on 12 foot diameter in lieu of 11 foot
03 31 00	Concrete-PS I, S, N, & Annex Bldg	468	CY	719.91	336,920	
	DIVISION TOTAL				449,796	
04 22 00	Concrete Unit Masonry	3,680	SF	23.27	85,638	Pump Station Bldgs N, S and I
	DIVISION TOTAL				85,638	
05 50 00	Metal Fabrications		LB	14.39		
	Metal Roof Deck		SF	3.58	-	
	DIVISION TOTAL				-	
06 10 53	Misc Rough Carpentry	4,929	BM	5.19	25,567	Pump Station Bldgs N, S and I
	T1-11 Siding	836	SF	2.31	1,931	Pump Station Bldgs N, S and I
	Roof Sheathing & Soffit Sheathing	4,260	SF	1.82	7,732	Pump Station Bldgs N, S and I
	PreFab Roof Trusses	24	EA	233.70	5,609	Pump Station Bldgs N, S and I



**PDX DEICING CONVEYANCE & TREATMENT SYSTEM ENHANCEMENT
COLLECTION & CONVEYANCE TO STORAGE**

MF 2004	CSI Description:	Qty	U/M	Unit Price	Total	Comments:
	DIVISION TOTAL				40,839	
	Waterproofing System-Walls Only	3,042	SF	8.60	26,169	
	Shingle Roofing	3,648	SF	7.49	27,333	Pump Station Bldgs N, S and I
07 62 00	General Sheet Metal	192	LF	9.44	1,812	Gutters & Downspouts
07 21 16	Blanket Insulation					
	Thermal Insulation	2,817	SF	2.18	6,149	Batt at ceilings
07 92 13	Joint Sealants					
	Building Interior	303	LF	3.45	1,045	
	Building Exterior	663	LF	3.45	2,287	
	DIVISION TOTAL				64,794	
08 11 13	Hollow Metal Doors & Frames	9	EA	2,485.20	22,367	
08 71 00	Door Hardware	9	SET	1,151.40	10,363	
	Skylights	3	EA	962.50	2,888	
	OH Coiling Doors-PS P		SF	74.10	-	Not included
	Entrance Hatch	6	EA	3,801.90	22,811	
	DIVISION TOTAL				58,428	
09 91 00	Painting-Exterior Masonry & T1-11	4,516	SF	2.15	9,688	
	Painting-Gyp Ceilings	2,817	SF	1.49	4,183	



PDX DEICING CONVEYANCE & TREATMENT SYSTEM ENHANCEMENT COLLECTION & CONVEYANCE TO STORAGE

MF 2004	CSI Description:	Qty	U/M	Unit Price	Total	Comments:
	Gyp Ceilings	2,817	SF	4.02	11,309	
	Coating-Interior of Below Grade Pump Stations		SF	4.09	-	Not included
	DIVISION TOTAL				25,179	
26 00 00	Electrical	5	EA	236,595.92	1,182,980	
	Exterior Security Cameras @ Pump Station	5	EA	12,718.13	63,591	
	Interior Lights	20	EA	-	-	Included
	Explosion Proof Elec-PS S & N	1,461	SF	12.49	18,244	meeting 4/13/09
	1 Inch Empty Conduit for Phone Line		LF	24.86	-	Deleted @ 4/13/09 meeting
	Ex/Backfill for Site Power	18,850	LF	15.71	296,209	
	Concrete Encasement	433	CY	168.00	72,800	
	Primary Service Feed-Empty Conduits	4,235	LF	86.87	367,885	ALLOWANCE2-5" EC Elrod 33rd-47th w/vaults
	Secondary Transformers @ Pump Stations		EA	30,975.00	-	Port to pay utility company direct
	DIVISION TOTAL				2,001,708	
33 09 00	Controls	4	EA	408,186.49	1,632,746	Includes site conduit/cable
	Demo @ PS J	140	MH	96.90	13,566	
	Pump Station J	1	EA	119,700.00	119,700	
33 32 16	Packaged Utility Wastewater Pumping Stations					
	Pump Station I	1	EA	547,200.00	547,200	Includes pumps, piping, valves, meters, etc.
	Pump Station N	1	EA	769,500.00	769,500	Includes pumps, piping, valves, meters, etc.
	Pump Station P	1	EA	1,436,400.00	1,436,400	Includes pumps, piping, valves, meters, etc.



**PDX DEICING CONVEYANCE & TREATMENT SYSTEM ENHANCEMENT
COLLECTION & CONVEYANCE TO STORAGE**

MF 2004	CSI Description:	Qty	U/M	Unit Price	Total	Comments:
	Pump Station S	1	EA	478,876.38	478,876	Includes pumps, piping, valves, meters, etc.
	DIVISION TOTAL				4,997,988	
35 05 23	Horizontal Directional Drilling	3,315	LF	518.38	1,718,426	Includes pipe
	Prep Pipe Laydown Area	87,500	SF	1.05	91,438	Clear grub, place work surface
	Fence @ Pipe Laydown	7,000	LF	3.25	22,715	Temporary Security
	DIVISION TOTAL				1,832,578	
	COLLECT MOVE TO STORAGE TOTAL				13,568,012	

ATTACHMENT 3

OCTAGON PROCESS INC.
TANK TRUCK LOADING REPORT

PRODUCT: _____	DATE: _____	TIME: _____
LOT NUMBER: _____	TANK #: _____	LOAD STATION: _____
QUANTITY ORDERED: _____	P.O. #: _____	CARRIER: _____
CUSTOMER: _____	DESTINATION: _____	

MILITARY: CONTRACT #: _____	D.O. #: _____	DD250 TO DRIVER: <input type="checkbox"/> YES
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TRAILER PRE-LOAD INSPECTION

(Each compartment of a multi-compartmented trailer must be inspected)

TRACTOR #: _____	TRAILER #: _____	# COMPARTMENTS: _____	ARRIVAL TIME: _____
LAST PRODUCT THE TRAILER CONTAINED: _____		WAS TRAILER WASHED OUT? <input type="checkbox"/> YES <input type="checkbox"/> NO	

IS TRAILER BEING USED FOR AUTHORIZED REPEAT LOADS? ☐ YES ☐ NO IF "NO", SKIP TO NEXT BOX.

Dome covers and outlets sealed? ☐ YES ☐ NO Seals verified to match receiving party recorded numbers? ☐ YES ☐ NO

IF THE TRAILER WAS NOT SEALED, OR THE SEAL NUMBERS CANNOT BE MATCHED, NOTIFY THE SUPERVISOR!

IF SEALS INSPECTION PASSES, THE DOME MAY BE OPENED AND THE TRAILER INTERIOR INSPECTED.

Does product residue appear to be correct product? ☐ YES ☐ NO Approximate amount: _____ SKIP NEXT SECTION

Tank interior clean, dry and odor free? <input type="checkbox"/> YES <input type="checkbox"/> NO	Pump clean, dry and odor free? <input type="checkbox"/> YES <input type="checkbox"/> NO
Valves and outlets clean, dry and odor free? <input type="checkbox"/> YES <input type="checkbox"/> NO	Hoses clean, dry and odor free? <input type="checkbox"/> YES <input type="checkbox"/> NO
Dome covers clean and in working order? <input type="checkbox"/> YES <input type="checkbox"/> NO	Are drip pans in place? <input type="checkbox"/> YES <input type="checkbox"/> NO
Safety valves and vents in working order? <input type="checkbox"/> YES <input type="checkbox"/> NO	Are drain valves to storm sewer closed? <input type="checkbox"/> YES <input type="checkbox"/> NO
Are all tank valves closed and secure? <input type="checkbox"/> YES <input type="checkbox"/> NO	Inspection passed, OK to load trailer? <input type="checkbox"/> YES <input type="checkbox"/> NO

TRAILER POST-LOAD INSPECTION

Correct amount loaded? <input type="checkbox"/> YES <input type="checkbox"/> NO	All seal numbers recorded on B/L? <input type="checkbox"/> YES <input type="checkbox"/> NO
Truck product sample secured? <input type="checkbox"/> YES <input type="checkbox"/> NO	Proper placards displayed? <input type="checkbox"/> YES <input type="checkbox"/> NO
Dome covers secure? <input type="checkbox"/> YES <input type="checkbox"/> NO	Right-To-Know label tag applied? <input type="checkbox"/> YES <input type="checkbox"/> NO
Seals applied to dome covers? <input type="checkbox"/> YES <input type="checkbox"/> NO	Driver has copy of product MSDS? <input type="checkbox"/> YES <input type="checkbox"/> NO
Outlet valves capped and not leaking? <input type="checkbox"/> YES <input type="checkbox"/> NO	Driver has "Driver's Checklist" form? <input type="checkbox"/> YES <input type="checkbox"/> NO
Seals applied to all outlets? <input type="checkbox"/> YES <input type="checkbox"/> NO	Driver paperwork completed and signed? <input type="checkbox"/> YES <input type="checkbox"/> NO

TRAILER INSPECTED AND LOADED BY: _____	DEPART TIME: _____
--	--------------------



February 26, 2010

Ms. Lisa Jackson, Administrator
U.S. Environmental Protection Agency
Mailcode 2822T
1200 Pennsylvania Avenue, NW
Washington, DC 20460

RE: Docket Number EPA-HQ-OW-2004-0038

Dear Ms. Jackson:

On behalf of the members of Airports Council International – North America (ACI-NA), I am pleased to submit the attached comments on the U.S. Environmental Protection Agency's (EPA) *Proposed Rule for Effluent Limitation Guidelines and New Source Performance Standards for the Airport Deicing Category* (Proposed Rule) that was noticed in the *Federal Register* on August 28, 2009 (74 *Fed. Reg.* 44,675) (Docket ID No. EPA-HQ-OW-2004-0038).

ACI-NA has worked closely with EPA staff regarding the Agency's 2002 Deicing Study and efforts leading up to the Proposed Rule for almost 10 years. In fact, the airport industry has worked closely with EPA on deicing stormwater permitting issues for almost 20 years. We appreciate EPA's willingness to engage ACI-NA and its members regarding the critical issues contained in the Proposed Rule. We look forward to continuing that working relationship and ensuring a healthy dialogue between regulators and the regulated community.

ACI-NA, however, believes that the Proposed Rule is ill-advised and will result in significant negative impacts on airports and the National Aviation System (NAS), while not generating commensurate environmental benefits. The aviation industry continues to recover from the many challenges resulting from September 11, 2001 terrorist attacks, as well as the downturn in our nation's economy. The high costs and liabilities associated with EPA's mandates in the Proposed Rule could cripple many airports that are vital to the NAS. This is particularly troubling and is compounded by our belief that the Federal Aviation Administration (FAA) has not been adequately engaged by EPA in this process and the arbitrary assumptions that provide the foundation for many of the Proposed Rule's most significant conclusions. ACI-NA strongly encourages EPA to proceed cautiously in moving forward with this rulemaking. EPA is under no mandate to finalize ELG standards, but if it proceeds towards that end, we

believe it must re-propose a new approach that relies on flexible measures that account for complex operations and significant variability, while also reflecting a far more coordinated engagement with FAA to prioritize safe public transportation and measurable, real world environmental benefits.

As EPA moves forward, it must address the following key issues and considerations:

- **New airports are new sources, not new runways or other enhancements.** ACI-NA believes that a new commercial airport that conducts deicing operations should be considered a “new source” subject to the Clean Water Act’s (CWA) “new source performance standards.” New runways or other enhancement projects at existing airports are not “new sources,” and EPA’s proposal to the contrary is misplaced and illogical. Airlines are responsible for applying aircraft deicing fluid (ADF), which EPA is attempting to control through collection and discharge standards in the Proposed Rule. Airlines do not apply ADF on runways or through new enhancements, other than when an airport builds deicing pads. Therefore, because runways or most other enhancements are not “sources” of ADF, they cannot become a reason for EPA to apply new source performance standards to the airport. In practice, EPA’s proposal will force, over time, all airports to have to install the most stringent collection and treatment standards, with no reasonable link to Congress’ intent to add such standards to the CWA.
- **EPA wrongly assumes that 80 percent of Type I ADF and 10 Percent of Type IV ADF are “available” for collection.** EPA has never studied the amount of ADF that can be collected at an airport. The Agency relies on unreliable source material and conjecture to reach conclusions about how much ADF an airport could collect. ACI-NA has identified a number of fundamental flaws with EPA’s analysis and approach, including EPA’s failure to account for defrosting ADF applications, variability in airport geography and weather patterns, aircraft fleet mix, and other critical factors. EPA’s arbitrary conclusions regarding what is “available” for collection undermine its entire collection standards approach in the Proposed Rule.
- **EPA has failed to establish an appropriate scope for its Proposed Rule.** EPA has contrived a multivariable, multi-step, convoluted process from which an airport might determine how the Proposed Rule would apply. Significant steps in this process have no rational relationship to ADF application frequency, quantity, or logistics. Instead, EPA’s approach would impose unreasonable standards on airports that use less than 500 gallons of ADF annually and may not discharge more than one gallon. ACI-NA believes that EPA should focus its attention, if at all, on airports that use significant quantities of ADF over long winter seasons. ACI-NA suggests a minimum threshold of 100,000 gallons of ADF used annually at an airport, which is a consistent threshold used within EPA’s Multi-Sector General Stormwater Permit.

- **EPA’s collection standards are arbitrary and force technologies on airports that cannot implement them.** EPA proposes two collection standards for airports depending upon the amount of ADF used by airlines – 60 percent collection for airports where airlines use large quantities, and 20 percent for lesser amounts. The 60 percent standard relies on collecting ADF at centralized deicing pads. In its Proposed Rule, EPA asserts that all airports subject to the 60 percent standard could install centralized pads, including land constrained airports like LaGuardia, JFK, and Boston-Logan. EPA’s assessment is wrong, and the Agency has no underlying demonstration to the contrary. Further, there are no alternative technologies that EPA can identify that would achieve a 60 percent standard. EPA has similar analytical problems with its 20 percent standard and its assertions that even the smallest ADF-use airports can buy, operate, or rent glycol recovery vehicles (GRVs) at little or no cost to comply. In both cases, EPA has completely ignored safety and operational impacts associated with its Proposed Rule.
- **EPA’s model treatment system will not be able to treat ADF stormwater to meet EPA’s proposed standards and ensure airport compliance with the CWA.** EPA establishes model treatment technology using Anaerobic Fluidized Bed Reactors (AFBR) to treat ADF stormwater to comply with numeric effluent limits. EPA based its proposal on the AFBR system that Albany has installed and modified over many years and adapted to their site-specific conditions. While the AFBR system in Albany serves that particular airport’s purposes very well, other airports experience ADF stormwater loads and conditions that vary significantly from Albany. And, even when Albany’s system could not meet EPA’s proposed limits, the Agency disregarded that data to derive final effluent limits. Ultimately, EPA misunderstands how AFBR systems operate, including at Albany, and derives proposed discharge limits that are not attainable, especially for EPA’s underestimated costs. EPA’s reliance on AFBR to meet the proposed limits is misplaced.
- **EPA has significantly underestimated costs and overestimated benefits.** Throughout the Proposed Rule, EPA has underestimated the costs of compliance for regulated airports. Individual ACI-NA members have identified that their individual costs would exceed EPA’s overall costs of compliance for the industry. EPA also has not accounted for operational delays and other direct costs associated with implementing the Proposed Rule. These costs are in the hundreds of millions of dollars, if not more. On the other hand, EPA has significantly overestimated any environmental benefit that might result from its Proposed Rule. Most of the benefits that EPA believes will result are theoretical and have no real world value. The principle pollutants associated with ADF are oxygen-depleting in nature. For airports that discharge to marine environments, there is zero benefit derived from installing collection and treatment systems. In fact, the current stormwater permit program and other CWA programs targeting water quality protection

already ensure that ADF discharges do not harm U.S. waters, or they are obligated to address such discharges outside the scope of the ELG program.

- **EPA's Proposed Rule is not cost-effective.** Over the past 35 years of promulgating ELG standards, EPA has established certain benchmarks for ensuring that its technology standards do not unfairly burden one industry over another. Congress also has set standards through amendments to the CWA. In this rule, EPA manipulates its rulemaking analyses to avoid having to compare the cost-effectiveness of this rule to that of past rules. However, as ACI-NA demonstrates, such comparisons still can be made and they reveal that this Proposed Rule is at least 10 times more costly to this industry than any prior ELG rulemaking. EPA has unnecessarily subjected this industry to ineffective and costly standards at a time when it is attempting to recover from a variety of economic challenges.
- **EPA should encourage active and ongoing research in pollution prevention and green programs, not simply mandate existing technologies that may not be appropriate for many airports.** EPA's Proposed Rule does not promote pollution prevention. The industry is focused on new technologies for applying and new formulations for manufacturing ADF that result in less threat to the environment. Airports also have taken a lead in green building, sustainability, environmental management systems and other important environmental initiatives. EPA's Proposed Rule represents a significant threat to those initiatives, siphoning funding from them into technologies that ACI-NA believes may not be the best long term approach to addressing deicing issues.

In sum, ACI-NA appreciates the opportunity to participate in this rulemaking effort. We encourage EPA to review our comments thoroughly and invite the Agency to seek clarification or enter into a dialogue with us as it considers its next steps. Please contact ACI-NA's Senior Director, Environmental Affairs, Jessica Steinhilber at (202) 861-8092, jsteinhilber@aci-na.org to discuss these matters further.

Very truly yours,



Gregory Principato
President, ACI-NA

**BEFORE THE UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY**

<hr/> Effluent Limitation Guidelines)	
)	
And Standards for)	
)	
The Airport Deicing)	EPA Docket No. HQ-OW-2004-0038
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Point Source Category;)	
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Proposed Rule)	
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**Advice and Recommendations of the
Airports Council International-North America**

February 26, 2010

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APPENDIX

I. INTRODUCTION

Airports Council International-North America (ACI-NA) appreciates the opportunity to submit comments on the Environmental Protection Agency's (EPA's) Proposed Rulemaking, EPA-HQ-OW-2004-0038 FRL-8948-2, Effluent Limitation Guidelines and New Source Performance Standards for the Airport Deicing Category (Proposed Rule).

EPA is obligated under the Clean Water Act (CWA) to develop ELGs for industrial categories that discharge non-trivial quantities of toxic and non-conventional pollutants.¹ However, Congress provided EPA with fairly significant discretion with regard to its ELG rulemaking decisions. Among the factors that EPA must consider in developing standards representing Best Available Technology Economically Achievable (BAT) include whether EPA's proposed technologies are in fact "available" to the target facilities and that the cost of achieving those standards is not inconsistent with comparable BAT standards in prior ELGs.²

The aviation industry is highly complex with many integrated participants. Aircraft deicing operations, particularly during the challenges associated with winter storm events, fully reflect the industry's complex interactions and pressures. From an ELG development perspective, regulating discharges from deicing operations, which necessarily involve airports, airline tenants, fixed-based operators (FBOs), and other federally-regulated entities, is by far the most difficult and complex challenge that the ELG program has ever faced. No prior ELG has ever faced such a variable and unpredictable scenario with regard to involved parties, frequency of operation, methodology, or geography.

ACI-NA's comments will demonstrate to EPA that its proposed Airport Deicing ELG standards are not "available" to many ACI-NA member airports, and even if they were, the costs of implementing those standards would be prohibitive. Further, regardless of availability or cost, implementing the proposed standards would not provide any significant resulting benefits. ACI-NA member airports already are subject to stringent National Pollutant Discharge Elimination System (NPDES) permits and other controls that ensure that current deicing operations do not pose environmental risk or harm to surrounding receiving streams. The current, more flexible, discharge controls work. EPA's proposed ELGs represent an additional layer of regulation that carries with it tremendous cost and little benefit to individual airports almost solely to the national scope and flawed analyses contained in EPA's rulemaking effort.

The ultimate key to deicing operations is to ensure public safety. The Federal Aviation Administration (FAA) oversees deicing operations towards that singular goal. Now, EPA is proposing to expand its regulatory control over airport and airline deicing operations and activities in such a way as to impinge on or impede existing and thorough regulation by the FAA. To the extent that Congress has granted FAA exclusive authority to regulate deicing and related ground operations that EPA's proposal may now alter, the Agency is preempted from pursuing such proposed regulations. Again, EPA's current, more flexible deicing discharge regulations provide adequate protection under the CWA, while avoiding conflict with FAA's regulatory scheme.

¹ 33 U.S.C. § 1314(m).

² 33 U.S.C. § 1314(b)(2)(b).

For all the reasons set forth in the following comments, ACI-NA urges EPA to reconsider its Proposed Rule. EPA's failure to fully consider its proposal's full impacts – including the impacts of its proposal on space constrained airports, small users of ADF, airports considering runway construction or redevelopment, and other ACI-NA members with unique characteristics that conflict with EPA's perception of airports – is a fundamental flaw that must be addressed. EPA has two options, in ACI-NA's view. Either it can abandon the Airport Deicing ELG rulemaking entirely, relying upon existing CWA controls that are currently proving fully sufficient to protect the environment. Or, it can repropose Airport Deicing ELGs – either through a new Notice of Proposed Rulemaking or a Notice of Data Availability – after it has been able to completely revamp its data collection and industry analyses/models. In any further action to control stormwater discharges from deicing operations, ACI-NA is motivated to work closely with EPA to ensure the most efficient and effective regulatory programs.

A. Airports Council International-North America (ACI-NA)

ACI-NA represents local, regional and state governing bodies that own and operate commercial airports in the United States and Canada. ACI-NA's 334 member airports enplane more than 95 percent of the domestic and virtually all of the international airline passenger and cargo traffic in North America. Nearly 400 aviation-related businesses are also members of ACI-NA, providing goods and services to airports.

B. Airport and Aviation Industry Background

1. General Overview

Airports and the aviation system are critical national resources that allow for the interconnectivity of goods, services, and individuals, both domestically and internationally. Of paramount importance to the aviation industry is ensuring the safety of the system. Deicing aircraft and airfield pavement surfaces is critical to ensuring safe operations in winter weather conditions and requires the joint cooperation of airports, airlines, pilots, fixed-base operators, FAA, and others.³

The aviation industry is also one of the most progressive and innovative sectors of our nation's economy. The industry has established an outstanding record of reducing the environmental impacts of its operations, often through voluntary initiatives. Deicing practices are not exempt from this characterization. Importantly, deicing activities are already subject to federal, state and local regulations from both a safety and environmental perspective.

It is critical that EPA understand the complexities of the aviation industry, particularly deicing operations, including the distinction and responsibilities between aircraft deicing and airfield deicing. Aircraft deicing is conducted to ensure that critical aerodynamic aircraft surfaces are

³ Appendix A contains Cleveland International Airport's 2009-2010 Local Airport Deicing Plan as an example of the intricate operational complexities and coordination that must occur in order to minimize the amount of time an aircraft spends on the ground after it has been deiced.

free of contaminants that can compromise flight performance. Airfield deicing is conducted to improve the quality of runway surface conditions and assure adequate aircraft braking performance on pavement surfaces contaminated with snow and ice.

2. Deicing Operations are Highly Complex Processes

Airports, airlines, and the aviation system are extremely complex, perhaps the most complex industry ever analyzed for an ELG. To create ELGs for deicing operations, EPA must confront, understand, respect, and successfully navigate this complex process which includes many different participants with important but overlapping responsibilities and governing regulations/policies. These processes also play out in varying methodologies depending upon the participants and unique airport situations and characteristics. As a result, aircraft and airfield deicing operations may not be conducted in the same manner and through the same processes at any two airports. Unlike other more “cookie-cutter” industries previously regulated by EPA through the ELG rulemakings, aircraft and airfield deicing operations do not present simple solutions, unless EPA decides to take a more generic, flexible, best management practices (BMP) type approach.

As proposed, EPA’s Airport Deicing ELG fails to recognize industry complexity and airport-by-airport variability. The Agency’s attempt to “simplify” its vision of the industry, while mandating precisely detailed technologies, would require significant changes in current deicing operations at many airports, potentially creating massive impacts to the aviation system. The following descriptions are intended to help EPA fully understand and respect the significant complexity of the operations and industry participants that it is attempting to regulate. All of this information was shared with EPA over the past 10 or more years in which we have interacted with the Agency on deicing ELG issues.

a. Airfield Pavement Deicing

Airfield pavement deicing, including runways, taxiways, and ramp areas, is routinely conducted by airports to delay the formation of physical bonding between runway surfaces and new winter precipitation, to penetrate and help break up hard packed ice and snow, and to groom and clear remnants of snow and ice from runway surfaces after plowing and power brooming have occurred.

Maintaining runway and airfield pavement surfaces in safe conditions and accurately reporting on the conditions of those surfaces is a responsibility of airport operators under 14 CFR Part 139. Airfield pavement deicing is a critically important activity, allowing airports to more quickly clear residual ice and snow and deliver higher friction surfaces for safe aircraft operations during winter storms. If this was not done, snow and ice removal would be significantly slower, potentially resulting in more delayed and diverted flights. The FAA is responsible for approving airfield deicing chemicals that airports use on airfield pavement surfaces.

Snow removal procedures at airports require significant coordination between airport operations personnel, airlines, fixed based operators, FAA air traffic control and other concerned parties. Snow removal plans are established long before the winter season, ensuring everyone involved in snow removal understands what to expect. Airport operators must have a snow control center

(SCC) that can manage all snow clearing operations, assess field conditions, and inform all impacted parties.

In addition to the requirement to clear runways and taxiways as completely as practical, airport operators are obligated to issue timely reports on the surface contaminant type and depth. In the case of extremely high snowfall rates, airports will note the length and width of the central portion of the surfaces that are cleared as well as the contaminant remaining on the portions that are not cleared. The goal of this reporting is to provide aircraft operators with accurate current descriptions of the contaminant type and depth so that the operator can use aircraft manufacturer provided data to determine if continued operation of an aircraft is safe.

b. Aircraft Deicing

FAA essentially requires that critical aircraft surfaces be free of contamination prior to takeoff. This requirement is met through a combination of deicing (removing snow, frost, and ice) and anti-icing (preventing additional accumulations). Aircraft deicing and anti-icing – jointly referred to as deicing – is accomplished through both physical means and the application of specialized deicing products. Deicing products must meet strict performance standards developed by the Society of Automotive Engineers (SAE) Aerospace Council. Aircraft deicing practices are governed by FAA regulations as well as through a number of advisory circulars, orders, and technical letters.

Because of the paramount importance of safety, substantial discretion is also afforded to pilots, allowing for supplemental deicing as deemed necessary. Aircraft deicing is performed by airlines, or their handling agents, to ensure compliance with FAA regulations requiring clean aircraft surfaces. Although airports play a role in assisting and facilitating airlines' performance of aircraft deicing, the primary responsibility for this activity lies with individual airlines. Because airports cannot dictate to airlines or pilots when or how much to apply ADF, they cannot control all aspects of deicing operations. Because they cannot control all aspects of deicing, EPA should not propose regulations that place all responsibility for such operations on airports alone. The Agency's fundamental misunderstanding or ignorance of responsibilities and complex interactions associated with deicing activities results in EPA oversimplifying its analyses. That oversimplification, while convenient for theoretical rulemaking, results in a Proposed Rule with illogical and unachievable regulatory obligations that burden airports, which arguably have the least control over the pollutants in question.

3. Deicing Operations Are Subject to Stringent Environmental Permitting.

Airports, as land owners of the facilities used by airlines and general aviation, must abide by the provisions set forth in the Clean Water Act, typically through a National Pollutant Discharge Elimination System (NPDES) permit which controls the deicing discharges. This may be done through a general or individual permit. There are several fundamental differences in the development of general vs. individual permits. General permits tend to provide more narrative approaches to fundamental permitting issues (for example, compliance with water quality standards and implementation of BMPs). Individual permits require a two-part analysis that first mandates implementation of appropriate technology standards (typically BMPs in stormwater permits) and next requires that the permit writer assess receiving water bodies and determine if

additional compliance requirements should be imposed to maintain water quality standards. Airports that discharge to smaller, more-sensitive water bodies will generate the more-stringent analyses and requirements. Lastly, all deicing management plans must correspond with the airport's Stormwater Pollution Prevention Plan (SWPPP).

To date, most of the NPDES permits issued to airports are based on a system of Best Management Practices (BMPs) that provide appropriate flexibility to account for the airport's overall lack of control of the act of deicing aircraft. Flexible regulatory approaches allow airports to work directly with airlines and FBOs to develop overall airport deicing programs and directives to ensure adequate environmental protection while still accommodating multiple parties and the inherent variability of the operations and conditions under which they occur. This approach also promotes pollution prevention and evolving research into more environmentally protective products and processes.

Subject to FAA Flight Standards, a number of practices are readily employed to reduce the amount of aircraft deicing fluid applied and its environmental impacts. Airports across the U.S. have also spent hundreds of millions of dollars constructing and maintaining aircraft deicing fluid collection, storage, and treatment facilities. Some airports, such as Pittsburgh, Detroit, and Denver, have constructed extensive centralized deicing pads that permit large numbers of aircrafts to be deiced just before proceeding to their departure runway. Other airports, where land availability or other constraints do not permit construction of centralized facilities, have designated areas on taxiways or cargo aprons for aircraft deicing. At some airports the only space available to perform deicing is at the terminal gates.

Spent aircraft deicing fluid may be captured at pads, aprons, or gates through specifically designed drainage collection systems, mobile collection equipment (such as glycol recovery vehicles), or some combination. Once collected, fluid may be stored in tanks or ponds prior to treatment, recycling, and discharge. Some airports conduct on-site biological or physical treatment to reduce environmental impacts and meet specific permit limits prior to discharge. Many airports discharge deicing stormwater to their publicly owned treatment works (POTWs). Several airports have on-site recycling facilities, allowing for the productive reuse of recovered fluid. Airports may also send collected deicing stormwater off-site for treatment or recycling. Finally, many airports discharge deicing stormwater into receiving waters, pursuant to permit requirements.

Overall, the infrastructure and practices in place at any particular airport vary to meet the specific needs and permitting requirements of that location.⁴ Myriad factors such as number and types of operations, fleet mix, climate, receiving water, and available space all must be taken into consideration as the aircraft deicing fluid application, collection, and treatment facilities are designed and operated. Because of these complexities, a single methodology or combination of methodologies has been identified as a "best practice" for minimizing the environmental impacts of deicing activities, most likely because no "best practice" exists from a national perspective – decisions are best made on an airport-by-airport basis.

⁴ Appendix B contains Cleveland International Airport's 2009-2010 Aircraft Anti-Icing/De-icing and Discharge Management Plan, detailing the airport's plan for ensuring safe winter operations while meeting environmental permit requirements.

Cutting through this NPDES permitting analysis is a critical underlying theme. Airports already are thoroughly regulated in this area and the CWA provides permitting authorities with all of the tools they need to protect local water quality. In fact, permitting authorities are ensuring that airports employ whatever necessary technologies are needed to protect water quality. However, this protection usually takes the form of flexible BMP programs. There is no need for additional regulation in this area.

Through EPA's site visits and the industry's responses to EPA's questionnaires, the Agency has seen how many airports have gone to great lengths and expense – from PDX to DIA to MSP to DTW and many others – to do what is necessary to protect the environment.

II. DETAILED AIRPORT INDUSTRY COMMENTS

A. New Source Performance Standards (NSPS) Should Be Limited to New Airports

The CWA defines “new source” at CWA Section 306(a)(2) and sets forth requirements for NSPS in CWA 306(b). EPA has also promulgated regulations regarding NSPS at 40 CFR 122.29. In its Proposed Rule, EPA has defined a new source as “(1) Any new Primary Airport constructed after [date of promulgation]; and (2) Any new runway constructed at a Primary Airport, the deicing operations associated with the departures on the new runway and the deicing of paved surfaces associated with the new runway.” EPA included a new runway within the definition of a new source based on the incorrect conclusion that a new runway meets the National Pollutant Discharge Elimination System (NPDES) program regulatory definition and criteria for a “new source.”⁵ For a new runway to qualify as a “new source,” it must first meet the definition of a “source”: “any building, structure, facility, or installation from which there is or may be a discharge of pollutants.”⁶

EPA's Proposed Rule and related technical development documents are virtually devoid of analyses that justify its proposed NSPS provisions as they relate to runways or related “enhancement” construction, and provide no associated economic impact or benefits analyses.⁷

⁵ As defined in 40 CFR 122.2, a new source is any new “building, structure, facility or installation from which there is or may be a ‘discharge of pollutants’ ...” 40 CFR 122.29(b) sets out specific criteria for determining whether a source qualifies as a “new source.” In addition to meeting the 40 CFR 122.2 “new source” definition, a source must also meet one of the following criteria: “(i) It is constructed at a site at which no other source is located; or (ii) It totally replaces the process or production equipment that causes the discharge of pollutants at an existing source; or (iii) Its processes are substantially independent of an existing source at the same site. In determining whether these processes are substantially independent, the Director shall consider such factors as the extent to which the new facility is integrated with the existing plant; and the extent to which the new facility is engaged in the same general type of activity as the existing source.”

⁶ 40 CFR 122.29 (a)(2).

⁷ In its proposal, EPA's only justification for incorporating runway construction in its NSPS standard is: EPA does not believe in general that new runways will be significantly integrated with existing airport facilities in a way that should prevent them from being identified as new sources (*see* § 122.29(b)(iii)).

74 Fed. Reg. 444676, 44,694 (2009). EPA's Technical Development Document only addresses the construction of a new airport, DIA, as its justification for its proposed NSPS collection standard. *See* Technical Development Document for Proposed Effluent Limitation Guidelines and Standards for the Airport Deicing Category (July

EPA's proposed NSPS requirements are illogical and unworkable in practice. Hence, EPA should limit the definition of a "new source" to "any new Primary Airport constructed after [date of promulgation]."

1. Practical Considerations Demonstrate Why Even Significant Construction or Redevelopment at Airports Should Not Be Considered New Sources.

In addition to legal reasons why ACI-NA asserts that anything short of constructing a new airport should not result in EPA applying NSPS standards to airports, there are numerous practical reasons neither a new runway nor any other airport construction project should be subject to NSPS. Runways and other construction projects are not sources of ADF pollutant discharges; they are not independent of other existing sources; and they will not necessarily result in an increase in ADF usage. The aircraft movement and deicing operations are wholly integrated within an airport system. There is no distinguishable "source" at an airport for which NSPS could apply. The actual source of ADF pollutant discharges is the aircraft operating in winter conditions, thus requiring the application of ADF.

For the reasons set forth below, EPA's proposed NSPS standards would create an unworkable menagerie of ADF collection and treatment standards in ways that have no reasonable relationship to the actual processes of deicing aircraft. Further, they would create obstacles to future airport operations, maintenance, and capacity enhancement by creating uncertainty until after the fact whether or not a permitting authority will consider such operations within the NSPS scheme. Hence, EPA's proposed NSPS standards are arbitrary and capricious.

2. Runways Are Not New Sources

The Agency specifically determined that a new runway meets the criteria for a "new source" because it is "substantially independent of an existing source at the same site." An airport, however, cannot be compared to a traditional plant or factory from which a new process, production line, or piece of equipment can be clearly distinguished as a new source of discharge associated with the existing facility. Specifically, a new runway should not be considered a new source for a number of reasons: (1) A runway is not a source of pollutant discharges from aircraft deicing activity; (2) A new runway is not "substantially independent" of an existing source; and (3) A new runway will not necessarily result in additional deicing activity at the airport.

2009)(hereinafter TDD) at 13-7. While the DIA example may support treating construction of a new airport as a basis for NSPS standards for such new construction, it does not provide any justification for including other construction at existing airports, including runways.

a. A Runway is Not a Source of Pollutant Discharges Associated With Aircraft Deicing Activity.

Not only does a new runway not meet the legal definition of new source, but an existing runway cannot even be considered a source because runways are not sources of pollutant discharges from aircraft deicing activities.⁸

Further, to the extent that a runway may be considered the source of pollutant discharges associated with pavement deicers, EPA's proposed NSPS to address these discharges are moot. Airports apply pavement deicers to runways, taxiways, ramp areas and other paved surfaces to ensure safe operations in winter conditions. The proposed NSPS associated with pavement deicing discharges requires that the airport either certify it does not use airfield deicing products containing urea or meet specified ammonia discharge limits. The NSPS do not differ from the airfield pavement discharge BAT proposed for existing sources. The whole purpose of NSPS is to force pollutant generating operations to "build into" the new source those "best available demonstrated control technologies" to most efficiently limit pollutants generated by that source. However, runways do not generate any pollutants to begin with, and the quantity of pollutants generated through the use of the runway generally is not impacted by whether the runway is new or "existing."

Any airport subject to the NSPS would already be subject to the same airfield BAT requirements, and thus, would already meet the airfield pavement discharge NSPS. Section 449.10(c) of the Proposed Rule requires that an airport "certify that it does not use airfield deicing products that contain urea." This certification is not specific to any particular runway, taxiway, or other paved area; it applies to the airport airfield in its entirety. A new runway would presumably not fall outside the scope of the certification. As an alternative, an airport choosing not to meet the certification requirement can demonstrate compliance with numeric discharge limits for ammonia. Again, these limits apply to the entire airport facility. Because the NSPS proposed for airfield pavement discharges are irrelevant, we presume EPA intended to include a new runway as a new source in order to address potential discharges associated with aircraft deicing.

While ADF-related pollutant discharges appear to be driving the proposed NSPS, ADF application, in most cases, occurs at locations away from airport runways. Most typically, these operations occur on or near aircraft parking aprons, in the vicinity of airport terminal buildings. At fewer airports, deicing operations take place on dedicated deicing pads which are usually sited at centralized locations near where aircraft exit terminal aprons.

Note that because of FAA design standards that have been instituted to ensure safe operations on runways and taxiways,⁹ aircraft deicing pads adjacent to runways at commercial service airports

⁸ To the extent that certain Type IV ADF may "shear off" of an aircraft's outer surfaces during take-off, EPA already has stated that such pollutants are "non-point source" pollution outside the scope of NPDES permitting regulations (74 Fed. Reg. at 44686).

⁹ These standards are enumerated in FAA Advisory Circular 150/5300-13, Airport Design (Change 14) (2008), specifically standards related to runway and taxiway separations delineated in Tables 2-2 and 2-3 of the document.

generally must be sited at least 560 feet away from runway centerlines.¹⁰ In most cases, the distance between the locations where deicing operations are conducted and runway centerlines is substantially greater. For example, at one of the airports cited in EPA's documents, Denver International Airport, deicing pads are over 1,000 feet away from the nearest runway centerline.

In addition, obstruction clearance requirements¹¹ and runway protection zone (RPZ) clearance requirements place substantial limitations on the ability of airports to site deicing pads near the ends of runways.

Thus, ADF applied at designated deicing areas and deemed "available for discharge" is unlikely to ever reach the runway. Any ADF that inadvertently reaches the runway is a result of adhesion to the aircraft during application and subsequent shearing off during takeoff. EPA deemed ADF that adheres to aircraft (as it is designed to do) as not "available for discharge" through its determination that only 80 percent of Type I and 10 percent of Type IV fluids is collectable.¹²

The inclusion of a new runway within the definition of a "new source" is most problematic for airports currently projected to fall within the 20 percent collection requirements. These airports are even more likely to be conducting deicing operations near terminal areas where vacuum trucks or similar technology would typically be employed to collect spent ADF. In these more typical situations, it is even more unlikely that pollutants associated with deicing fluid would be discharged from the runway.

For these reasons, a runway does not discharge pollutants associated with aircraft deicing operations and, therefore, does not meet the definition of a "source." As such, EPA should not include new runways within the definition of a "new source."

b. A New Runway is Not "Substantially Independent" of an Existing Source.

EPA determined that a new runway meets the criteria for a new source based on the reasoning that a new runway is "substantially independent of an existing source at the same site." Airports are complex, integrated systems of runways, taxiways, aprons, and gates. Any particular runway could have specified uses (e.g., arrivals only, cross-wind runway, noise abatement) or be integrated within general operations. Each runway is not operated independently from other runway(s) at that airport.

¹⁰ The 560 foot separation cited here represents the required setback of fixed or movable objects from a runway and associated parallel taxiway for FAA Airplane Design Group V aircraft, which many commercial service airports have been designed to serve. This separation consists of a 400 foot separation between runway centerline and parallel taxiway centerline and 160 foot separation between the parallel taxiway centerline and fixed or movable objects (i.e., aircraft parked on the deicing pad during deicing operations). Note that this minimum separation can be up to 200 feet more if the runway in question is equipped for low visibility operations.

¹¹ These include requirements contained in 14 CFR Part 77, *Objects Affecting Navigable Airspace*, and FAA Order 8260.3B, *United States Standard for Terminal Instrument Procedures (TERPS)*.

¹² EPA acknowledges that "Type IV fluid, an anti-icing chemical, is designed to adhere to the aircraft." 74 Fed. Reg. at 44686. EPA mistakenly assumes states that Type I fluid is not designed to adhere to aircraft surfaces; however, that statement is incorrect. Type I fluid is also designed to have adhesive properties.

The deicing operations associated with aircraft departing from any particular runway are also not clearly distinguishable. This is particularly true when deicing operations are located near points of terminal area egress, as they typically are for airports currently projected to fall within the 20 percent collection requirements. Because both the runway and ongoing deicing operations are part of a wholly integrated airport system, a new runway cannot be considered “substantially independent” of an existing source and does not meet the regulatory criteria for a “new source.”

c. A New Runway Will Not Necessarily Result in Additional Deicing Activity at the Airport

EPA has falsely assumed that a new runway per se equates to additional traffic and, therefore, additional deicing fluid application and associated pollutant discharges. The addition of a runway can be undertaken for a number of reasons, many of which will not lead to increased traffic. Oftentimes, a runway is added or simply relocated to help improve the efficiency of an airport that has met or exceeded its air traffic capacity needs. In other words, the actual number of operations may not increase, but existing operations will run more efficiently. In fact, the improved efficiency of existing operations could result in a decreased use of deicing fluid as aircraft are less delayed, and thus less likely to exceed their holdover times and require additional deicing.

A runway may also be added for uses that have no relation to levels of aircraft deicing activity. For example, a runway may be added for use only by arriving aircraft or in specific weather conditions. An excellent example of such a situation can be found at Boston-Logan International Airport, where recently-constructed Runway 14-32 was constructed to provide added capacity when high winds out of the west are present at the airport. Such wind conditions occur almost exclusively in good weather situations when deicing does not occur. Another example is recently-constructed Runway 10-28 at Hartsfield-Jackson Atlanta International Airport, where the runway is used almost exclusively by arrivals, which have no need to be deiced.

As these examples show, there is no nexus between new runways and deicing discharges. The number of runways is irrelevant to the amount of ADF applied at the airport and certainly will not result in an increase in pollutant discharges. Therefore, it is unreasonable to assume that the addition of a runway will cause an increase in deicing activity and related pollutant discharges.

d. The Proposed New Source Performance Standards Cannot Practically Be Applied to a New Runway

As discussed above, EPA proposes to define new runways as “new sources” of ADF. The Proposed Rule goes on to state that new runways accordingly would be subject to NSPS, which require collection of 60 percent of applied ADF regardless of the annual amount of ADF that is used at the airport. At airports where less than 460,000 gallons of ADF is used annually, the NSPS would stand in stark contrast to the standards that would apply to existing runways. These “existing source performance standards” only require 20 percent of applied ADF that is used to be collected.

As has already been stated, ADF use cannot be correlated with the number of runways at an airport. It is also not dependent on whether these runways are new or existing. However, even if

a correlation could be established, the dual set of performance standards creates substantial compliance issues. We fail to see how compliance with these performance standards would be assessed. It is also unclear whether airport operators will be required to track which aircraft used new runways and which used existing runways. At many airports, this would create a substantial data collection burden on airport operators.

The dual set of performance standards also creates difficulties for airport operators in effectively managing deicing collection efforts to comply with the Proposed Rule. Deicing fluid collection systems—such as deicing pads—are not necessarily integral components of runways. Deicing fluid collection may have taken place on airport aprons or at centralized deicing facilities where departures using new runways and existing runways would be comingled. Under such circumstances it would be impossible to differentiate deicing fluid collected from new runway departures versus existing runway departures.

Because of the impracticality of complying with dual performance standards, we believe the only practical way in which airports could comply with the Proposed Rule would be to collect 60 percent of all applied ADF at the airport, regardless of runway use and ADF usage, significantly increasing the costs and unrealistically portraying the feasibility of compliance associated with the Proposed Rule. If EPA retains its NSPS in their current form, these increased compliance costs must be considered.

We fail to see how an airport could comply with different collection requirements for different departure runways. The deicing associated with aircraft using the new runway is unlikely to be conducted under separate operations as that associated with existing runways. In fact, FAA specifically advises that an airport should follow one deicing procedure for all users in order to minimize confusion. Following one procedure will help “ensure the facility’s safety benefits can be achieved in an operationally efficient and cost-effective manner.”¹³

The only way an airport could ensure compliance with this requirement is to collect 60 percent of applied ADF at the entire airport. In order to ensure an airport is meeting the 60 percent collection requirements for departures associated with a new runway, the airport would have to collect 60 percent of all applied ADF. Otherwise, an airport may risk that an aircraft assigned to take off from an existing runway is deiced where only 20 percent collection requirements are met, but that aircraft is later assigned to take off from the new runway where 60 percent collection is now required. The only way an airport could practically ensure compliance with these separate collection standards would be to meet 60 percent collection at the entire airport.

e. The Proposed New Source Performance Standards May Present a Barrier to Entry for New Runways

We understand that NSPS are promulgated under the belief that new sources have the opportunity to install the best available technology. EPA has determined that deicing pads are BAT for collecting 60 percent of applied ADF that is available for discharge. EPA has also determined that the proposed NSPS would not pose a “barrier to entry” for new runways because “the costs for a centralized deicing pad are estimated at ten percent or less of the total cost for a

¹³ FAA Advisory Circular 150/5300-14B, Design of Aircraft Deicing Facilities (2008).

new runway.” While we generally agree with the notion that new sources have the best opportunity to install the best technology, we find EPA’s analysis of this issue to be flawed and incomplete. In fact, the installation of deicing pads in conjunction with a new runway may not be possible or operationally optimal given any particular airport’s circumstances. For example, as with several airports currently proposed to meet 60 percent collection requirements, there may not be space available to construct a deicing pad in conjunction with a new runway while still meeting the FAA required setback requirements for safe operations. Additionally, if current deicing activities occur near terminal areas, it may not be operationally optimal to establish a separate deicing area away from those already designated areas. EPA also stops short of fully analyzing the costs associated with 60 percent collection and treatment for new sources.

EPA’s conclusion that deicing pads represent less than ten percent of the cost of a new runway is based on a memo comparing costs for installation of deicing pads at four airports with costs to install new runways at five different airports.¹⁴ The analysis contained in this memo is specious and based on an extremely small sample of incomparable project cost data from disparate airports incurred at disparate times. As we have continuously demonstrated to EPA, every airport is unique. Even the costs associated with the installation of the same type of technology or infrastructure (here deicing pads and runways) at four or five different airports cannot be used to predict the approximate cost of installing the same type of infrastructure at another airport.

This unpredictability is particular true for a technology such as deicing pads whose costs will vary greatly depending upon a number of variables, including the type and volume of winter precipitation typically received, runway and taxiway use patterns during winter operations, the type and number of aircraft operations that occur during deicing events, available space, number and location of pads, and whether the pads are constructed as part of a larger project. This variation is evident from the four airport pad costs (ranging from \$5,100,000 to \$79,300,000) relied on in EPA’s analysis which reflect airports with very different pad systems designed to meet each airport’s specific needs. Even the number of pads included in each airport’s system varied. The cost to install deicing pads cannot be determined from simply averaging the cost estimates for these highly varied systems.

EPA compared the average pad installation cost to the averaged cost of the installation of a new runway. The installation costs for a new runway are calculated by averaging the costs to install a runway at five different airports, ranging from \$47,500,000 to \$1,150,000,000. Again, the costs associated with the installation of a new runway are obviously highly variable and cannot simply be determined by averaging the costs associated with the installation of five other runways. A number of factors also impact the expected cost of installing a new runway, including available land, topographic and geotechnical issues associated with the runway site, runway length and width requirements, and costs to mitigate environmental impacts, among others. This variation is again evident from the runway costs used in EPA’s analysis which range from \$47,500,000 for a 7,800 foot runway in Phoenix to \$1,150,000,000 for a 9,000-foot long runway Atlanta. It is notable in this particular comparison that Phoenix’s runway was constructed entirely within airport property boundaries on a reasonably flat site, whereas Atlanta’s runway involved

¹⁴ Memorandum, Comparison of Airport Deicing Pad Costs to New Runway Costs, EPA-HQ-OW-2004-0038-0831 (October 2008).

substantial property acquisition; extensive site preparation; and substantial new taxiway infrastructure, including expensive taxiway bridges over an interstate highway.

The standard deviations associated with the cost data used in the analysis clearly emphasize the significant variations in the project cost data and suggest that a great deal of caution should be used in drawing conclusions based on simple arithmetic averages of these limited data. The standard deviation of the four deicing pad cost estimates is \$32 million, almost three-fourths of the average of \$45 million. The standard deviation of the five runway cost estimates is \$507 million, which exceeds their average of \$490 million.

Even without conducting any statistical analysis, we can easily see that the costs of pad systems at both Cleveland and Minneapolis-St. Paul exceeded the cost of a new runway at Phoenix. Additionally, EPA made no analysis of data from airports installing deicing pads *and* a runway during the same project. Therefore, we find it extremely troubling that EPA ultimately concluded that the cost of installing a pad would not impose a barrier to entry based on this memo.

Even if EPA's estimate that deicing pad installation costs equate to approximately 10 percent of the cost of installing a new runway, those costs are not insignificant. For example, Port Columbus International Airport is expending \$160 million to replace and relocate its south runway. The project will be funded through a combination of FAA provided funding and revenue generated by the airport through the collection of passenger facility charges. The airport already has extensive infrastructure in place to collect and treat its deicing fluid, meeting all the applicable environmental regulations. The addition of \$16 million dollars to such a project for the installation of a deicing pad, which is unlikely to provide additional environmental benefit, would create a significant financial challenge to the airport.

More importantly, EPA limited the runway to pad cost comparison to deicing pad installation costs only. This incomplete analysis fails to account for the true costs associated with requiring 60 percent collection for departures associated with a new runway. There are significant annual operations and maintenance costs, along with operational costs and impacts that must be factored into deicing pad costs. EPA must also account for the associated storage, conveyance, and treatment costs that will result from collecting additional ADF. Once the complete costs associated with 60 percent ADF collection and treatment are taken into consideration, the barrier to constructing a new runway becomes significantly higher.

Overall, EPA cannot rely on this oversimplified and statistically flawed memo as the basis for its determination that the costs of installing a deicing pad while constructing a new runway are not significant enough to present a barrier to entry for new runways. Additionally, a more complete analysis of the full costs associated with imposed 60 percent collection must be performed. We see no actual data in the administrative record to support EPA's conclusion.

3. EPA's Proposed NSPS Are Not Cost-Effective if Applied to Existing Airports

Should EPA include new runways within the definition of a "new source," EPA's proposed NSPS will essentially require those airports planning to construct a new runway to collect 60 percent of all available ADF applied at that airport. As discussed above, it is impossible for an

airport to distinguish operations, and thus deicing collection requirements, by runway. Therefore, it is likely that an airport constructing a new runway will have to collect 60 percent of available ADF applied at the entire airport. At airports currently subject to 20 percent collection requirements, collecting additional ADF would require extensive infrastructure for necessary collection, storage, and treatment. In essence, the NSPS proposal relating to runway and other construction would result in an eventual conversion of many airports to the 60 percent collection requirements over time, even though EPA already determined are not cost-effective for most airports when it established an annual ADF usage threshold of 460,000 gallons for the 60 percent collection requirements.¹⁵ Also, as we will later discuss, it may already be impossible or extremely cost-inefficient for infrequent ADF users to collect 20 percent of available ADF. Requiring those airports to collect 60 percent even further compounds this already impossible feat.

There simply is no logical reason for treating two otherwise similar airports differently from a regulatory perspective because one built a new runway. We have demonstrated and EPA has asserted that there is no direct connection between numbers of runways, age of runways, or other runway “attributes” that impact how much ADF will be used at any given airport. Hence, EPA’s proposal to treat these similar airports (assuming they fit the 20 percent collection category before runway construction) differently after such construction is arbitrary and capricious and inconsistent with Congressional intent with regard to NSPS.

4. Other Construction Activities Should Not Be Considered a New Source.

In the Proposed Rule, EPA states that other construction activities could be considered a new source. EPA states that:

it is possible that permit authorities, on a case-by-case basis, would be able to deem other types of construction activity for aircraft movement areas to constitute a new source as well. For example, a permit authority might deem the substantial improvement or replacement of an existing runway to be a new source if that activity is deemed to “totally replace the process or production equipment that causes the discharge of pollutants.”¹⁶

We disagree with any possible inclusion of such activities as a “new source.”

Runway improvements and rehabilitations are routinely conducted as critical projects to maintain safe aircraft operations. These projects are generally significantly lower in cost than construction of a new runway. As such, the “barrier to entry” would be significantly higher. It is critical that the ability of an airport to maintain the integrity of existing runways, taxiways, and other infrastructure should not be hampered by the addition of potentially high costs associated with constructing and operating infrastructure necessary to meet additional ADF collection and

¹⁵ EPA’s preamble raises the prospect that NSPS could be applied by permit writers not only to new runways, but also to other significant construction projects. 74 Fed. Reg. at 44,694. To demonstrate how this conversion to NSPS might occur, ACI-NA members have reported that at least 10 new runways have been opened since 2003, and another 10 are projected to be built this decade. Further, if permit writers decide that major runway enhancements or extensions also should be subject to NSPS, then the conversion to the 60 percent collection standard will occur even faster than through new runway construction.

¹⁶ 74 Fed. Reg. at 44,694

treatment requirements. It should not be assumed that any construction activity at an airport will cause additional deicing discharges, or that any construction activity affords the opportunity to undertake significant additional projects.

In addition, the potential inclusion of other construction activities within the definition of a “new source” makes it impossible for airports to adequately predict the potential impact of the proposed NSPS on their future operations and costs. Giving great discretion to the permit writer to decide which projects trigger the NSPS is even more troublesome, as we will discuss later in these comments. If any capacity enhancement or other construction activity could increase the airport’s collection requirements to 60 percent, eventually all airports will be required to collect and treat 60 percent of applied ADF. EPA has not adequately analyzed the costs associated with such a requirement, which would undoubtedly be cost prohibitive.

B. EPA’s Collection Standard is Based on a Flawed Calculation Regarding “Availability”

EPA has proposed that 80 percent of applied Type I ADF and 10 percent of applied Type IV ADF is available for collection. EPA based its 80 percent statistic (for Type I ADF) on a 1999 report generated at a workshop focused best management practices for airport deicing stormwater.¹⁷ The report indicated that 75-80 percent of Type I ADF is deposited on airfield pavement from overspray and dripping. EPA is mistaken to rely on this report to conclude that 80 percent of Type I ADF is available for collection. The report focused on significant deicing activities that occurred during precipitation events, not infrequent or dry-weather defrosting events during which significantly less ADF is applied and thus available for collection.¹⁸ As shown in the Charts XX, recent data from Detroit Wayne County Metropolitan Airport (DTW) – an airport considered an industry leader in deicing fluid management and collection and found by EPA to meet BAT – indicates that 25-27% of applied ADF is unavailable for collection. During defrosting, much less ADF is used, and thus, much less reaches the pavement, making it potentially available for collection. ACI-NA recommends that EPA revisit its “available” determinations to more reliably account for actual ADF availability, including during defrosting operations.

¹⁷ TDD at 10-19 (citing Switzenbaum, et al. 1999. Workshop: Best Practices for Airport Deicing Stormwater. DCN AD00893).

¹⁸ The term “defrosting” may be interpreted slightly differently depending upon location and local weather conditions. As set forth in these comments, ACI-NA believes that EPA must address the defrosting issue if it is to pursue final ELGs based on a collection standard. Hence, EPA will be responsible for defining the term, but ACI-NA will poll its membership and suggest an appropriate definition if EPA concurs that defrosting must be addressed in any final rule.

Figure 1. DTW 2008 / 2009 Deicing Fluid Fate

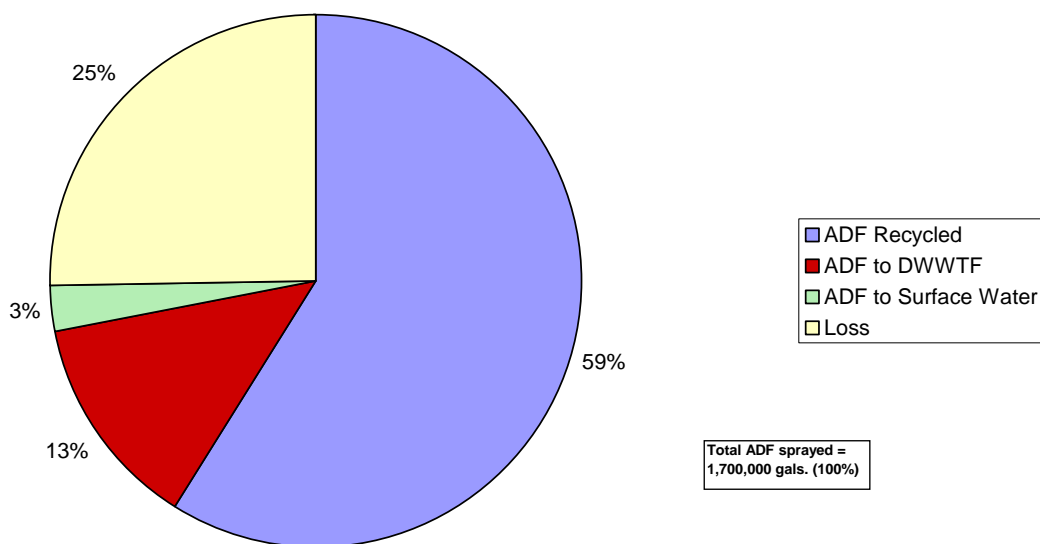
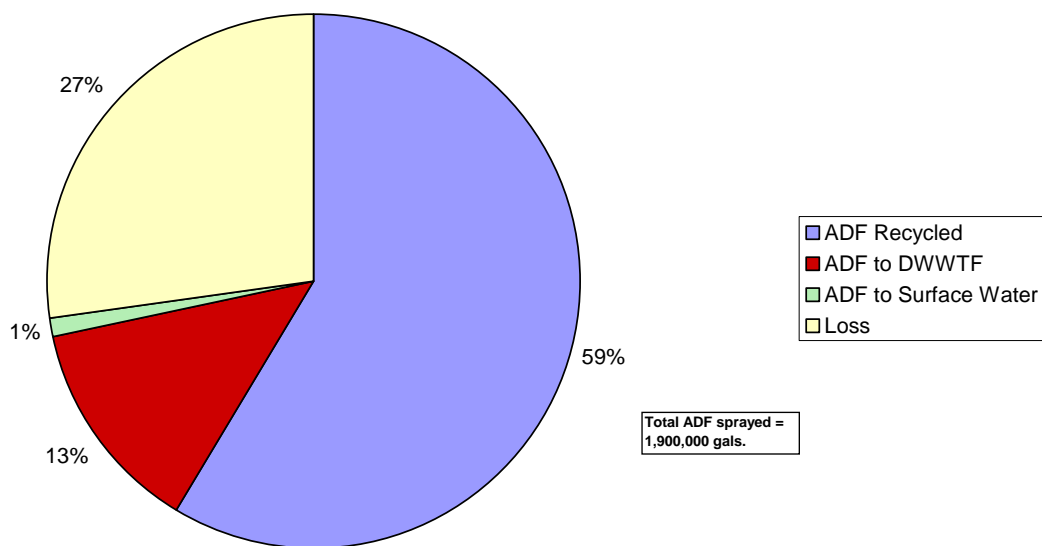


Figure 2. DTW 2007 / 2008 Deicing Fluid Fate



”Availability” depends on numerous variables associated with actual airport deicing operations, particularly during dry weather defrosting. These relatively universal variables include the amounts of Type I and Type IV ADF that:

- remains on the aircraft
- adheres to, and soaks into pavement surfaces
- is carried away as wind drift or via jet blast
- is tracked out of the area on the tires of aircraft and ground support equipment
- is lost to evaporation, biodegradation, and other natural processes that both inhibit collection but do not result in actual discharge.

In addition, other factors impact the amount of ADF available for collection on an airport-specific basis. These include:

- climate or weather
- collection system configuration
- deicing operation (e.g., dry weather defrosting versus deicing)
- size of the airport/number of operations
- aircraft fleet mix
- other miscellaneous site-specific factors.

The fraction of defrosting ADF that is collectable is heavily dependent on local conditions, especially climate. A lack of precipitation highly impedes the collection of applied ADF. The impact of this phenomenon on an airport’s ability to collect ADF can be significant when a large portion of overall ADF usage is associated with defrosting operations. For this reason, it is recommended that separate collection calculations be conducted on ADF used for defrosting versus deicing.

EPA has oversimplified its “availability” approach. The Agency’s use of a constant fraction of availability does not accurately account for significant differences in the amounts and fate of ADF applied during deicing, particularly in comparison to defrosting operations. The latter may constitute significant amounts of a total ADF application at an airport, and yet cannot possibly generate 80 percent collection availability. The amount of fluid available for collection is also impacted by the quantity of fluid applied, how much fluid reaches the ground, and the actual weather at the time of application.

For those airports located in warmer climates that only occasionally apply minimal amounts of ADF, the amount of ADF available for collection in fact could be zero or so close to zero that collection would provide no environmental benefit. In all cases, defrosting presents little or no environmental threat because little or no ADF is actually discharged. In essence, evaporation or other natural degradation represent essentially a 90 – 100 ADF collection standard in terms of preventing discharge to waters of the U.S.

Specifically, defrosting operations typically result in limited areas of damp pavement under a defrosted aircraft. Such fluid quickly begins evaporating and seeping into pavement surfaces, meaning a very limited amount of ADF is available for safe *collection* either immediately after a

defrosting operation or during subsequent precipitation events. This fluid is also found to biodegrade quickly.¹⁹ Therefore, nearly 100 percent of ADF is prevented from discharge. Yet, EPA appears focused only on collection as opposed to discharge prevention.

1. Defrosting Operations Are Too Significant to Ignore in Any “Availability” Calculation.

At many airports, a significant percentage of the total applied Type I ADF is used during dry weather defrosting events. The lack of precipitation impacts not only the amount of fluid necessary, but also the amount that is available for collection. At southern airports such as Tallahassee Regional and Phoenix Sky Harbor International Airports, all deicing fluid is applied during dry weather defrosting events. Even at northern airports such as Minneapolis-St. Paul, no precipitation occurs during 70-75 percent of the deicing days (termed “defrosting days”). Yet those dry weather defrosting days account for only 23-28 percent of the total applied Type I ADF. Des Moines International Airport uses approximately 40 percent of its ADF for defrosting.²⁰ Reno-Tahoe International Airport uses approximately 50 percent for defrosting. The percentage may be higher for smaller airports where flights are more likely to be cancelled in actual winter precipitation events, meaning that most ADF is applied in defrosting conditions. In contrast, Pittsburgh International Airport only uses about two percent of its total applied Type I fluid for defrosting.²¹ These significant variations point to the need for a flexible methodology to determine the actual percentage of total applied ADF that is available for collection on a site-by-site basis.

Several airports have assembled data on their ADF usage separately during defrosting and deicing operations. For example, Minneapolis-St. Paul International Airport assembled the data in Table 1 regarding glycol applied during defrosting days and precipitation days over the 2007-2009 deicing seasons. The data essentially shows that less ADF is applied per aircraft during defrosting events (29-42 gallons during defrosting compared to 92-107 gallons during deicing). At MSP, 23-28 percent of the total applied ADF occurred during defrosting days, which accounted for 48-49 percent of total aircraft deiced.

¹⁹ Research has also shown that ADF biodegrades significantly over relatively short periods of time. See *Low Temperature Biodegradation of Airport De-Icing Fluids*, Water Science and Technology, Vol 48, No 9, pp 103–111 (2003) indicating “[t]he measured surface biodegradation rates for de-icing products based on ethylene/diethylene glycol (*Konsin*), propylene glycol (*Kilfrost*) and potassium acetate (*Clearway*) at 4°C were 0.082, 0.073 and 0.033 day⁻¹. The resulting reductions in the potential BOD loadings, of a single application of a typical mixture of these products, over a 5 day biodegradation period are predicted to be 32.9%, 30.2% and 21.4%, respectively at 8°C, 4°C and 1°C.” (note, this study also included potassium acetate, a pavement deicer)

²⁰ Des Moines International Airport analyzed data from its 2004-2005 deicing season and found that out of a total of 67 deicing days, 49 days consisted only of defrosting in the morning with no precipitation. Of the 73,649 gallons of glycol used for that season, 31,670 gallons were applied for frost busting.

²¹ Over the 2001-2009 deicing seasons, PIT data shows an average of 5,296 gallons out of 401,894 total gallons ADF applied was used for defrosting, or about 1.7%.

Table 1. Minneapolis-St. Paul International Airport Defrosting Data Evaluation, 2006 – 2009

	Nov. 1, 2006 - Apr. 15, 2007	Nov. 1, 2007 - Apr. 15, 2008	Nov. 1, 2008 - Apr. 15, 2009
Total Deicing Days	144 of 166 possible	164 of 167 possible	155 of 166 possible
Total Aircraft Deiced	11,110	18,317	16,914
Total Glycol Applied	685,649	1,377,293	1,240,387
Total Glycol Collected	307,294	612,678	535,151
Defrosting Days*	106	122	111
Total Aircraft Deiced on Defrosting Days	5,327 - 48% of aircraft deiced	8,772 - 48% of aircraft deiced	8,338 - 49% of aircraft deiced
Total Glycol Applied on Defrosting Days	155,902 - 23% of applied	355,278 - 26% of applied	348,217 - 28% of applied
Avg Gallons/Aircraft Applied on Frost Days	29	41	42
Precipitation Days*	38	42	44
Total Aircraft Deiced on Precipitation Days	5,783 - 52% of aircraft deiced	9,545 - 52% of aircraft deiced	8,576 - 51% of aircraft deiced
Total Glycol Applied on Precipitation Days	529,747 - 77% of glycol applied	1,022,015 - 74% of glycol applied	892,170 - 72% of glycol applied
Avg Gallons/Aircraft Applied on Precip Days	92	107	104

*Days with no recorded precipitation or trace precipitation were considered “defrosting days.” All other days were considered precipitation days.

Another example in Table 2 shows rough estimations of the variations in ADF required to deicing different aircraft in different weather conditions. This data is only an example from one airline application at one airport and is expected to vary by aircraft, airport, weather, and other factors. However, it is indicative of the fact that weather conditions greatly affect quantity of ADF applied.

Table 2. Example Estimated ADF Application by Aircraft Type in Various Weather Scenarios for One Airline at One Airport

Aircraft	Frost (gal)	Ice (gal)	Lt Snow (gal)	Snow (gal)
B-737	55	395	76	162
B-757	53	158	82	140
CRJ	29	64	42	89
E135-E175	35	109	40	130
MD-88	58	196	65	121

At low ADF use airports, the majority of usage is associated with defrosting activities, which generate little if any runoff.²² Defrosting operations do not involve removal of accumulated snow or freezing precipitation, and as a result use much smaller volumes of ADF are required than for

²² See U.S. EPA, Preliminary Data Summary Airport Deicing Operations (Revised) at 5-1 (August 2000) Stating “Because fluid used during dry-weather deicing is relatively small compared to that during storm events and does not generally generate contaminated storm water, EPA believes the vast majority of contaminated storm water is generated during precipitation events.”

deicing operations.²³ Most of the ADF used for defrosting remains on the surface of the aircraft and only a small fraction of applied defrosting ADF that falls to the pavement is potentially available for collection. Often, no runoff is generated at all by defrosting.²⁴ Mass balance data collected over several years at Austin-Bergstrom International Airport in Texas clearly illustrate this phenomena, with less than 10 percent of all applied ADF being collected during mild, dry winters, where the majority of glycol use is for defrosting, while the same collection system captures up to 40 percent of applied ADF during extreme winters when most of the glycol is used for deicing. Compliance with the 20 percent collection requirement is technologically infeasible for low-use airports that focus primarily on defrosting.

In addition, the prospective environmental benefits from the collection of runoff from defrosting operations are insignificant. As EPA has noted previously, “These (defrosting) operations are not likely to significantly impact the surrounding environment (or publicly owned treatment works (POTW)) because only a small amount, if any, of spent deicing fluid enters the environment, and pollutant loadings from these airports would be negligible.”²⁵

Overall, the amount of ADF available for collection during dry weather defrosting events is insignificant. EPA must account for this factor in establishing both the scope of the Proposed Rule and the collection requirements.

C. EPA Must Establish Scope Parameters Related to Deicing Operations

As proposed, the scope of the rule is based on airports that have more than 1,000 annual scheduled commercial jet aircraft departures, regardless of weather or time of year. EPA’s collection and treatment requirements kick in for those airports with 10,000 or more annual departures, regardless of how many of those might actually need to be deiced prior to departure. EPA has specifically requested comments on alternative threshold criteria for establishing the scope of the rule. As proposed, the scope is defined without regard to the frequency and magnitude of aircraft deicing activities and is inappropriate for small and low deicing activity airports. ACI-NA suggests that EPA scope those airports that should become subject to deicing ELGs with some relationship to the significant occurrence of actual deicing operations, and to treat those with de minimis deicing discharges as “out-of-scope” and irrelevant to future ELGs.²⁶

1. EPA Must Establish Thresholds That Exempt Airports Using Minimal ADF.

EPA does not establish a de minimis threshold based on ADF usage, but rather eliminates airports from the rule’s scope based on departures. For several reasons, it is critical that EPA establish a de minimus threshold to eliminate those airports using minimal ADF:

²³ *Id.* at 4-13, noting 20-50 gallons of ADF are used per aircraft during defrosting.

²⁴ See Appendix C exhibiting the limited deicing fluid that reaches the pavement during defrosting.

²⁵ See U.S. EPA, Preliminary Data Summary Airport Deicing Operations (Revised) at 4-17 (August 2000).

²⁶ ACI-NA notes that EPA requests comment on, but in no other way discusses military airports or military use of “in-scope” airports. ACI-NA is willing to help connect EPA staff with ACI-NA members that have significant military presence at their airports, but the implications of COD additions to regulated airport stormwater must be accounted for and addressed in any final rule.

1. There is no technology that is available for collecting a meaningful fraction of ADF from airports that use little of it.
2. Only a trivial fraction of the ADF applied at airports that use small quantities will be discharged to surface waters.
3. It is very cost-ineffective to attempt to collect and treat ADF at airports that use little of it. The pounds of discharge abated are very low (usage is low, most usage is for defrosting, little of that reaches surface waters, hence baseline load is low, and control measures can do little to reduce this baseline load). The costs are relatively high – investing in control equipment across an entire airport that must be at-the-ready at all times in order to control minimal discharges that occur only, at most, a couple times a year – is necessarily inefficient.
4. Congress did not intend for EPA to craft ELG standards for all dischargers, particularly those that represent trivial pollutant sources.

As proposed, the rule includes airports that use environmentally insignificant volumes of ADF. An example is Ontario International Airport in California where EPA estimates an average annual ADF usage of 34 gallons. Of the 100 airports in the scope of the Proposed Rule that are required to collect 20 percent of available applied ADF, roughly 27 are estimated by EPA to have less than 1,000 gallons of ADF used annually.

Keeping de minimis airports within the scope of the rule also could create the ridiculous scenario in which an airport that cannot achieve 20 percent collection due to limited defrosting operations could become subject to the 60 percent standard if it undertakes major construction or adds a runway (becoming subject to NSPS). No benefit is derived by including such airports into any ELG, let alone subjecting them to the most stringent standards.

A fundamental flaw in EPA's approach to defining the scope of the Proposed Rule is that none of the parameters are related to actual use of ADF. Thresholds based on aircraft departures, regardless of type²⁷, do not reflect the occurrence or magnitude of actual deicing activities. EPA makes clear that it recognizes the importance of weather in defining deicing activity because it evaluated Snow or Freezing Precipitation (SOF) days in the statistical stratification of airports in its airport survey framework for the rule. What is not clear is why EPA chose to ignore SOF days or other weather-related factors in defining the scope of the Proposed Rule. We are not advocating an SOF-type approach, per se, but we believe that using the SOF concept in relation to other factors could create a more predictable and activity-related threshold than merely departures.

Finally, EPA should establish a de minimis no-risk level based on ADF usage below which BAT standards would not be required. The Agency previously made such a "risk" determination with regards to an ADF usage rate of 100,000 gallons/year²⁸ in the Multi-Sector General Permit

²⁷ EPA's exclusion of propeller aircraft ignores that fact that turbo prop aircraft are commonly used for scheduled regional service and do get deiced under winter conditions to ensure safe operations.

²⁸ Importantly, the MSGP 100,000 gallon threshold is based on ADF "as purchased" before dilution (or "neat"). See section II.J.1 for ACI-NA's comments on EPA's definition of "normalized ADF."

(MSGP).²⁹ This threshold has been validated by its retention through several cycles of the MSGP, and could have served as a starting point for establishing de minimis criteria for the Proposed Rule. EPA should explain why it would not be appropriate as the basis for a de minimis cutoff for the ELG.

2. The Proposed Thresholds are Generally Poor Reflections of Significant Deicing.

EPA proposes thresholds for applicability of the ELG requirements based on annual scheduled commercial air carrier jet, total departures, and normalized ADF usage. These departure metrics are problematic for a number of reasons: (1) Departure numbers are subject to frequent changes and fluctuations; (2) Airports are generally not familiar with nor do they track “scheduled commercial air carrier jet departures;” and (3) These departure metrics are unrelated to actual deicing activities.

Most important of these reasons, departure-based thresholds are irrelevant to actual deicing activities. EPA explained that the 1,000 annual scheduled commercial air carrier jet departures was established based on the belief that those airports falling below the threshold “have a higher proportion of propeller-aircraft flights, which are typically delayed or cancelled during icing conditions.” (EPA, 2009) However, there is no basis for this assertion. In fact, many commercial air carriers rely on turboprop aircraft as essential components of their fleet mix, including operations in all weather conditions. The proposed 1,000 annual scheduled commercial air carrier jet departure threshold is inappropriate for the proposed ELG. If EPA intends to exclude certain airports from the rule based on the fact that they use less ADF, EPA should instead establish a scope threshold that is directly related to deicing activity.

The proposed 10,000 annual departure threshold for collection captures many airports that use only minimal amounts of ADF. There are a number of airports that meet or far exceed the departures threshold of 10,000 annually, but use minimal amounts of ADF. As noted above, the required collection of 20 percent of “available” applied ADF will be technologically challenging, if not infeasible at these small use airports, either because they use ADF for limited defrosting or perhaps for only one or two SOFP days per year. Some examples of such airports that are in the scope of the Proposed Rule (along with EPA’s estimate of annual ADF usage) include:

²⁹ See EPA MSPG Part 8.S.6 (http://www.epa.gov/npdes/pubs/msgp2008_finalpermit.pdf). When EPA originally established monitoring requirements for the Air Transportation Sector (Sector S), it deviated from the monitoring methodology used in other sectors because it deemed airports one of three “high priority” sectors from which it believed collecting additional monitoring data was appropriate. See 60 Fed. Reg. at 51,078 (Sept. 29, 1995). EPA used 100,000 gallons of ADF (neat) as its monitoring threshold to ensure it obtained data from airports that comprised a majority of ADF users. *Id.* at 51,002. EPA has never provided an analysis of Sector S sampling data since 1995 that demonstrates that airports using more than 100,000 gallons of ADF present an environmental threat after implementing BMP controls. Hence, such a threshold arguably should be the lowest threshold for “in-scope” airports subject to any Deicing ELG. After all, if EPA cannot demonstrate a threat based on its regulatory mechanism designed specifically to assess whether a threat exists at airports using more than 100,000 gallons of ADF, pursuing BAT standards for much smaller ADF users appears arbitrary.

Table 3. In Scope Airports with Low ADF Usage

Airport	ADF Usage (gals)
El Paso Intl	16,228
William P Hobby	14,168
San Antonio Intl	12,749
McCarran Intl	10,644
George Bush Intercontinental Airport/Houston	10,243
Birmingham Intl	5,002
Bethel	4,897
Nome	3,047
Ralph Wien Memorial	2,500
Tucson Intl	2,342
Palm Beach Intl	1,023
Jacksonville Intl	1,001
Southwest Florida Intl	950
Pensacola Regional	828
San Francisco Intl	105
Ontario Intl	34

In comparison, a review of EPA's Airport Impact Model spreadsheet indicates that 121 of 354 commercial service airports considered were excluded from the scope of the Proposed Rule because they fell below the departures thresholds.³⁰ Some of these airports are estimated by EPA to have significant volumes of ADF usage and no current collection in place. The following table lists the top out of scope airports in terms of EPA's estimate of ADF usage.

Table 4. ADF Usage by Out of Scope Airports

Airport	Estimated ADF Usage (Gals)	Annual Jet Departures	Annual Departures	EPA Assumed Current Collection
DLH	68,169	2,445	2,873	0%
CDB	61,177	3	3,983	0%
ATW	57,845	7,276	8,536	0%
HYA	46,147	5	16,414	0%
CWA	43,624	3,287	5,746	0%
AVP	42,537	4,265	6,213	0%

EPA indicates that these exclusions were based on costs and pollutant reduction to be achieved. According to EPA:

not applying the 1,000 annual jet departure cutoff would only increase the volume of deicing fluid that is within the scope of today's proposed rule by 1 to 2 percent yet would potentially result in high costs to smaller airports that have minimal pollutant contributions. Accordingly, it is appropriate to establish this exclusion because it avoids projected significant adverse economic impacts on this segment of the industry without excluding from the national standards a significant pollutant load.³¹

³⁰ Airport Impact Model, EPA-HQ-OW-2004-0038-0631 (2008).

³¹ 74 Fed. Reg. at 44,689.

The purpose of the two charts above and EPA's quote is to demonstrate the illogical approach EPA used to scope the applicability of the Proposed Rule. On the one hand, airports with very little ADF usage but many flights will have to spend significant quantities of money and resources to design collection systems for de minimis quantities. On the other hand, airports with much more significant use are justifiably exempted from the proposed standards. In fact, ACI-NA agrees with EPA with regard to airports that use up to 100,000 gallons of ADF representing little benefit at significant cost. This further justifies the MSGP approach cited above.

3. The Thresholds Departure Data Is Difficult to Ascertain and Highly Subject to Fluctuation.

In addition to the illogical results of EPA's proposed approach, the practical implications of EPA's threshold persuade us that it is an ill-advised approach. The only way for an airport to determine whether it meets the established thresholds is to access TransStat data using a complex multi-step process provided by EPA:³²

1. Go to <http://transtats.bts.gov>
2. Along the left side, under "Data Finder," click on "By Mode: Aviation."
3. Then select "Air Carrier Statistics (Form 41 Traffic) - All Carriers."
4. Then select "T-100 Segment (All Carriers)."
5. On the next screen, scroll down to the **Origin** section, and for the first line item, "Origin Airport Code," click on the "Analysis" link.
6. The next screen initially shows passenger data for each airport. Use the data filters near the top of this screen to get the overall departure figures (all aircraft).
Filter Categories: Origin
Filter Variables: DepPerformed
Filter Statistics: Sum
Filter Years: 2008 or earlier (2009 is not yet complete)
 Then click the "'Recalculate" button.
7. You then get a large table of departure figures with the airport codes alphabetically listed in rows, with the airport names shown (including foreign airports). You can sort by the departure figures if desired; sort commands are along the left edge of the screen; click on "Value Descending." This table can be downloaded as a spreadsheet--click on "Download results" near the top of the screen.
8. To get the jet aircraft subset, click on the "Crosstabs" link along the left side of the screen. On the next screen, set the data filters as follows:
Filter Rows: Origin
Filter Columns: AircraftGroup
Filter Variables: DepPerformed
Filter Statistics: Sum
Filter Years: 2008 or earlier (2009 is not yet complete)
 Then click the "'Recalculate" button.

³² Email correspondence from Eric Strassler, "Instructions for Using BTS Database" (October 6, 2009).

9. *This generates a large table with the airport codes (but not the airport names) listed in rows, and the aircraft types displayed horizontally. Aircraft Group codes range from 0 to 8, and jet aircraft are in groups 6, 7, and 8.*

These metrics are not common within the aviation industry, which generally rely on enplanements or total operations for purposes of measurement and planning. While the data can be gleaned from this complex process, it is illogical for EPA to instill new, meaningless metrics within the industry, particularly metrics that are unrelated to the deicing activities which are the subject to the Proposed Rule.

EPA's proposal also presents significant confusion and problems for airports that fluctuate between different categories of requirements. An airport on the boundary of a threshold will be challenged to determine what their requirements are and, more importantly, what they will be in the future.

Aviation is a volatile industry with operations and deicing activities at any particular airport varying year-by-year. Fluctuations in the regional aircraft fleet mix between jet aircraft and turbo props could cause an airport to move back and forth across the 1,000 departures threshold, and with little advance warning. This unpredictability leaves an airport unable to effectively plan for the future and at risk of being in non-compliance with a permit requirement because of unpredictable factors.

ADF usage can also change unpredictably from year-to-year, and over the 5-year averaging period suggested in the Proposed Rule. ADF usage is highly dependent on climate and operations. An airport that is close to the 460,000 gallon threshold may move between collection requirement categories regularly, even using a five-year average. The table below shows the great fluctuations in ADF usage at Pittsburgh International Airport, just in the few years since EPA gathered data for this Proposed Rule. In light of the radical declines in commercial air traffic seen in the past few years, as well as improvements in the efficiency of ADF application, airports are also faced with the possibility of having a 5-year average ADF usage that exceeds 460,000 gallons per year while traffic and ADF usage are clearly on a downward trend below this threshold. The current basis and structure of the scope of the rule do not speak to these dynamic factors in the industry.

Table 5. PIT Annual ADF Usage 2002-2009

Deicing Season	Date Range	TOTAL PG Pure [gal]
2002	2001-09-01 to 2002-05-31	272,433
2003	2002-09-01 to 2003-05-31	772,574
2004	2003-09-01 to 2004-05-31	670,029
2005	2004-09-01 to 2005-05-31	338,283
2006	2005-09-01 to 2006-05-31	233,209
2007	2006-09-01 to 2007-05-31	342,343
2008	2007-09-01 to 2008-05-31	276,930
2009	2008-09-01 to 2009-05-31	309,351

These noted deficiencies may be addressed, in part, by using threshold parameters that are stable over periods of time, related to deicing, and consistent with airport planning processes. Some parameters that meet this criterion are suggested later in these comments.

4. Illogical Results from EPA's Non-ADF Based Scoping Process Predictably Generates Illogical Financial Impacts and Unreasonable Cost-ineffectiveness.

The analysis presented in this section was conducted using EPA's Airport Impact Model spreadsheet.³³ This model provides EPA's characterization of service level (i.e., hub category), ADF usage, SOFP days statistical weight, un-weighted and weighted ammonia and total COD removal, and un-weighted and weighted cost for total pollutant removals for 153 airports under each of the four options considered. COD attributable to only the ADF collection component of the Proposed Rule was estimated for each airport by subtracting the COD of ammonia removed from total COD removed under Option 3, assuming 2.73 lbs COD/lb ammonia. Costs for COD removal associated with ADF collection for each airport were calculated by subtracting urea substitution and monitoring costs from total Option 3 costs. Weights were applied to the resulting totals for each airport. The weighted totals were then summed to obtain totals for the Proposed Rule. The information on hub category and SOFP days was used in examining stratified subsets of the population of airports represented in EPA's model.

The following table shows estimates of cost per pound of COD removed as the result of the ADF controls in the Proposed Rule by hub size and SOFP days, using an SOFP threshold of 3 days. All values are based on EPA's estimates of COD removal and cost.

³³ Airport Impact Model, EPA-HQ-OW-2004-0038-0631 (2008).

Table 6. Costs Per Pound of COD Removal by Hub Category and SOFP Days.

Hub Category	Cost per pound of COD Removed*		
	SOFP ≤3	SOFP >3	All Airports
Large		\$3.01	\$3.01
Medium	\$27.22	\$2.49	\$2.69
Small	\$22.31	\$6.17	\$7.15
Non-		\$10.05	\$10.05
Overall	\$24.64	\$3.10	\$3.15

* Based on Option 3 weighted 2006 costs in EPA 2009a minus any urea removal costs

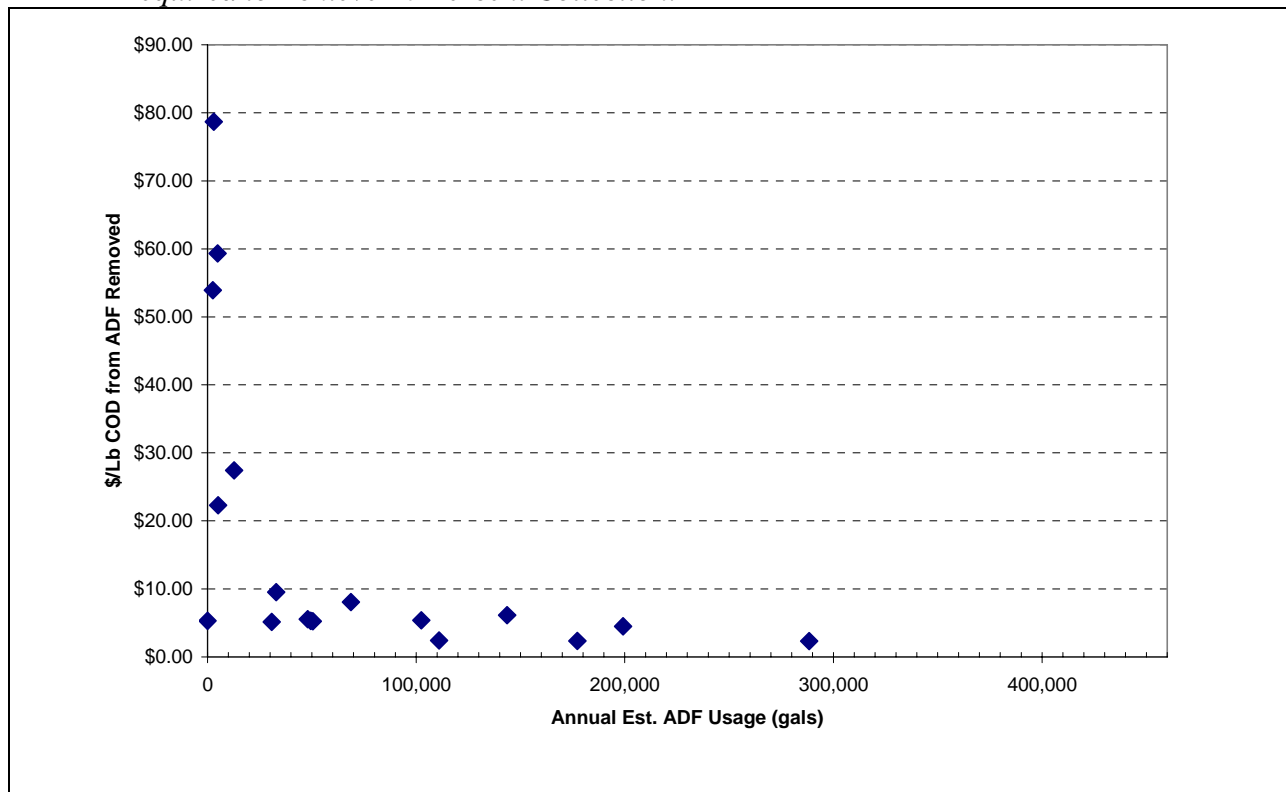
To put these costs in perspective, EPA estimated a cost of \$6.30/lb COD removed at airports with less than 10,000 annual departures, and cited lack of cost-effectiveness in justifying the exclusion of these airports from the Proposed Rule.³⁴

The per pound COD removed in the rule at airports in areas with 3 or fewer SOFP days is roughly an order of magnitude higher than at airports where SOFP days exceed 3. In addition, the cost per pound of COD removed by the proposed ADF collection requirements at small and non-hub airports in any region of the country is dramatically higher than at medium and large hub airports.

The following figure shows estimated cost per pound of COD removed versus estimated ADF usage at airports where additional controls would be required to comply with the proposed 20 percent collection requirement. Again, all values are based on EPA's estimates of COD removal and cost. The figure shows that the cost per pound of COD is significantly higher at lower use airports, and the "knee of the curve" falls around 40,000 – 50,000 gallons per year.

³⁴ See Memorandum, Regulatory Option Development for the Airport Deicing Operations Rulemaking Proposal, EPA-HQ-OW-2004-0038-1099, at 15 (November 2008).

Figure 3. Cost Per Pound of COD Associated with ADF Removed by the Proposed Rule Versus Annual ADF Usage at Airports Where Additional Controls Are Estimated to be Required to Achieve 20 Percent Collection.



The values presented here are an optimistic portrayal of the cost effectiveness of the proposed rule. All of these analyses are based on EPA's estimates of ADF usage, baseline COD loadings, COD removal, and cost of compliance. As is presented elsewhere in these comments, there is reason to believe that ADF usage, baseline COD loadings to surface waters and pollutant removal have been overestimated and collection and treatment costs have been underestimated. Correcting inaccuracies in EPA's estimates will significantly increase the cost per pound of COD removed by the Proposed Rule.

5. EPA Must Establish a De Minimis Threshold That Is More Consistent, Easy to Understand, Directly Related to Significant Aircraft Deicing Activities, and Cost-Effective Compared to the Proposed Departures-Based Approach.

The estimated cost per pound of COD removed by ADF controls in the Proposed Rule is disproportionately high at all airports in geographic regions with 3 or fewer SOFP days. These costs are not justified by the incremental benefit from removals. These airports represent just 0.1% of the estimated total weighted COD removed by the ADF collection requirements in the proposed rule. EPA may consider eliminating airports in regions with 3 or fewer SOFP days from the scope of the Proposed Rule.

EPA's analysis provides a basis for setting a meaningful threshold on low ADF use airports. Specifically, EPA stated, "Airports with less than 10,000 total annual departures have been excluded from ADF collection and treatment requirements based on possible economic achievability concerns."³⁵ EPA goes on to conclude that "[m]oreover, airports with less than 10,000 annual departures are smaller airports and may have greater difficulty raising funds to meet these ADF requirements."³⁶ As noted above, some excluded airports have significant volumes of estimated ADF usage. The usage estimates for the excluded airports, and the examination of cost per pound of COD removed are consistent with a threshold of approximately 60,000 gallons per year of ADF usage as the lower bound on practical cost-effective control under the Proposed Rule.

With one exception (Deadhorse, AK³⁷), all non-hub airports use <60,000 gals per year. Non-hub airports represent 1.4 percent of the estimated total weighted COD load removed by ADF controls in the Proposed Rule.³⁸ The cost of this removal based on EPA's estimates is very expensive at more than \$10/lb COD. If EPA has underestimated actual cost, the cost per pound will be even more expensive. As noted previously, EPA concluded that a cost of \$6.30/lb COD removed at airports with less than 10,000 annual departures was not cost-effective. Thus, eliminating non-hub airports from the scope of the Proposed Rule is consistent with the rationale that smaller use airports should be excluded from the rule in consideration of cost and pollutant reduction factors.

The cost per pound of COD removed as the result of proposed ADF controls at small hub airports is \$7.15, approximately twice that at medium and large hub airports, and significantly higher than \$6.30/lb COD cost that EPA judged to be not cost-effective. Small hub airports represent 1.7 percent of the COD removal from ADF controls in the Proposed Rule and may not be justified for inclusion in the scope of the requirements for ADF collection.

Again, these costs are, at best, an optimistic portrayal of the cost effectiveness of the Proposed Rule. Adjusting them to reflect realistic costs for implementation of collection and treatment controls will result in significantly poorer cost-effectiveness of the Proposed Rule.

6. A De Minimis Threshold Is Proposed Based on Parameters That Directly Relate to Aircraft Deicing Activities and Consider Cost-Effectiveness and Environmental Benefit.

For purposes of application of the ADF collection and treatment requirements, we recommend limiting the scope of the Proposed Rule using parameters that are commonly available, related to deicing, and not subject to frequent changes. Better parameters include hub size and number of SOFP days. Hub status is not expected to change frequently. Following EPA's approach, SOFP

³⁵ 74 Fed. Reg. at 44,705.

³⁶ *Id.*

³⁷ EPA estimated SOFP days from other airports in Alaska, estimated ADF usage from that estimated SOFP and a very questionable regression analysis (Figure 10-2 in TDD), and assumed 100 percent collection of applied ADF).

³⁸ U.S. EPA, Environmental Impact and Benefit Assessment for Proposed Effluent Limitation Guidelines and Standards for the Airport Deicing Category (hereinafter EIBA) at 98-100 (July 2009).

days are based on approximately 30 years of weather records, and would also be stable over time.

For example, by eliminating small, non-hub airports and those with three or fewer SOFP days, annual cost impacts would be reduced by an estimated \$7.8 million while only reducing annual COD removal by 3.1 percent (or 845,500 lbs).

D. Collection Requirements

Under the Proposed Rule, airports with more than 10,000 annual departures will be required to collect applied ADF. EPA is proposing to require those airports where less than 460,000 gallons of ADF is used annually to collect 20 percent of available ADF. EPA has further determined that glycol recovery vehicles (GRVs) represent the best available technology economically achievable (BAT) for meeting the 20 percent collection requirement. For airports at which 460,000 gallons or more of ADF is applied annually, 60 percent of available ADF must be collected, with centralized deicing pads identified as BAT for 60 percent collection. EPA proposed three methods for demonstrating compliance with the ADF collection requirements: (1) Demonstrate operation of GRVs or centralized deicing pads in accordance with precise technical specifications; (2) Use a different ADF collection technology, use GRVs or centralized deicing pads with different technical specifications, or use pollution prevention technologies; or (3) Demonstration the collection standards are being met through a monitoring program. Importantly, the permitting authority, not the airport, decides which method of compliance will be required.

1. EPA's Assumptions Regarding Available ADF Are Inaccurate and Overly Rigid.

As discussed in section II.B, the assumptions EPA has made regarding the amount of applied ADF available for collection are inaccurate and do not account for site and weather-specific factors impacting availability. These inaccurate assumptions with regards to available ADF also impact EPA's proposed collection requirements. Rather, EPA must establish a flexible way to account for conditions that impact the amount of ADF that is available for collection. In addition, because "uncollected" does not mean "discharged to waters of the U.S.", EPA should carefully consider how to address practices that do not result collection but also do not result in discharge. In the Proposed Rule, EPA has taken a far too simplistic, one-size-fits-all approach to a highly complex site and multi-party operation.

2. GRVs Are Not BAT if BAT Is Represented by a 20 Percent Collection Standard.

EPA has determined that glycol recovery vehicles (GRVs) represent a best available technology (BAT) for collection of applied ADF for airports that use less than 460,000 gallons of ADF. EPA also determined GRVs, when operated as specified by EPA, are capable of collecting 20 percent of applied ADF. We find a number of inaccuracies in and lack of support for EPA's underlying assumptions with respect to GRV use. Additionally, EPA has not analyzed the critical safety and operational impacts associated with increased GRV use.

a. EPA's Basis for Establishing GRVs as BAT Is Unclear.

EPA identifies GRVs as a model technology capable of collecting 20 percent of available ADF. However, EPA has provided no data, analyses, or support indicating that an airport relying solely on GRVs can achieve a 20 percent collection mandate. In addition, EPA has not demonstrated or identified that an airport operating a GRV (or even multiple GRVs³⁹) using the proposed specifications set forth in Section 449.20(b)(1)(i) can meet the proposed collection requirements. EPA relies on GRV efficiency performance data from only four airports to establish the 20 percent standard,⁴⁰ even though 53 airports were found to currently use GRVs. EPA reported that those four airports collect 22.5 to 53 percent of applied ADF. However, as EPA also notes, none of those airports rely *solely* on GRVs to collect ADF.

Each airport's deicing collection system relies on a combination of GRVs with some other collection technology (catch basin inserts, plug and pump technology, and/or apron systems). GRR uses two tow-behind glycol collection units in conjunction with catch basin inserts. MKE combines mobile glycol collection with a plug and pump system. BUF relies on two glycol collection vehicles and an apron collection system. In order to establish GRVs as BAT, EPA must be able to demonstrate that an airport can meet the proposed collection requirements using only that technology. Otherwise, the model technology, as demonstrated above, is GRVs in combination with additional structural in-ground ADF collection, which EPA has not analyzed for purposes of the Proposed Rule. The Agency has simply failed to justify GRVs as a stand-alone model technology. If EPA intends for BAT to consist of GRV use in conjunction with another collection technology, the Agency must conduct the proper technical feasibility and cost analyses and re-propose.

In addition, EPA provides no support indicating that an airport operating GRV(s) in accordance with the specifications set forth in section 449.20(b)(1)(i) of the Proposed Rule can meet the 20 percent collection requirement. EPA provides no support showing that any airports currently operate GRVs using only the proposed (or similar) specifications. If in fact any such airports exist, EPA should provide the collection efficiencies they achieve by operating them in that manner and name those airports as the basis for its model technology.

GRV performance is impacted by a number of variables. EPA must demonstrate that they have accounted for these variables before setting a collection standard associated with GRVs. These variables include: the number of GRVs utilized; the type of GRV used; weather conditions (including evaporation rate); whether they are used in conjunction with other collection methods, etc. As we will later discuss, EPA has not specified the type of GRV, number of GRVs, or other specific conditions under which an airport can achieve 20 percent collection through employment of mobile collection technologies. We fail to see how EPA can establish GRVs as BAT for collecting 20 percent of available ADF without further analysis.

³⁹ We will later discuss EPA's lack of clarity with regards to the number of GRVs an airport is required to operate in order to collect 20 percent of available ADF.

⁴⁰ TDD at 9-4. EPA relied on data from Grand Rapid's Gerald R. Ford International (GRR), Providence's Theodore Francis Green State (PVD), Milwaukee's General Mitchell International (MKE), and Buffalo Niagara International (BUF) airports.

b. The Proposed Specifications for GRV Use Are Troublesome.

In section 449.20(b)(1)(i) of the Proposed Rule, EPA proposes technical specifications to be set forth as permit requirements as one of three possible methods for demonstrating compliance with the 20 percent ADF collection requirement. The proposed specifications are problematic, unclear, and, as discussed in the previous section, have not been demonstrated to allow an airport to achieve the proposed 20 percent collection requirement.

(1) EPA Should Not Use “GRV” as a Generic Term.

The Proposed Rule specifies that an airport must use a “glycol recovery vehicle” or “GRV” to demonstrate compliance with the 20 percent collection requirement. A GRV is a specific trademarked brand and model of mobile collection technology. The class of mobile collection technology includes both truck chassis and trailer mounted equipment, all of which are employed at various airports. For example, many small airports use Mobile Collection Units (MCUs), which are tow-behind units. In addition, new technologies that accomplish the same function in different ways may appear in the future.

The appropriateness of any particular type of mobile collection technology may vary by airport, and airports should be permitted to choose the technology within that class that best meets their individual collection needs. We do not believe EPA intended to require that a specific brand or model of mobile collection technology be used to meet the proposed requirements; however that should be clarified in the final rule.⁴¹ To the extent that EPA relies on mobile collection technology for any future collection standard, it must determine and confirm that any and all such collection units are capable of meeting the model technology, or specify the precise units EPA is relying upon.

(2) EPA Does Not Specify the Number or Type of GRV(s) Required.

Section 449.20(a)(1)(i) of the Proposed Rule requires the “[o]peration of a GRV...”(emphasis added). EPA, however, has not indicated the number or type of GRVs that may be required and how extensive the GRV collection program must be at any particular airport in order to collect 20 percent of available ADF.

As proposed, EPA implies that operating a single GRV may be suitable to meet the 20 percent collection requirements. Good engineering practice, however, may suggest otherwise. In fact, multiple GRVs may be required, depending on a number of factors, including number of gates, the location of deicing activities and the airport layout. Surely, airports with multiple deicing locations and those using large quantities of ADF (but falling under the threshold of 460,000 gallons) would require more than one GRV in order to successfully collect 20 percent of available ADF. Regardless, EPA does not specify whether multiple GRVs may be required or not to meet the model technology standard.

⁴¹ For purposes of simplicity, ACI-NA’s use of the term “GRV” throughout these comments is intended to represent all forms of mobile collection technology.

EPA provides no guidance on how an airport would determine the number of GRVs necessary to collect 20 percent of available ADF. In the airport deicing questionnaire, EPA did not ask airports how many GRVs they operated. Yet, in Table 11-3 of the Technical Development Document, EPA presents GRV capital and annual costs based on six airports. Conveniently, EPA assumes that each airport utilized only one GRV/airport, but this assumption is incorrect. Hence, EPA underestimates the costs of GRV implementation for the Proposed Rule.

For costing purposes, EPA implies that the number of GRVs that may be required is a function of the number of deicing stormwater outfalls at the airport. However, EPA does not provide a rational basis for such a far-flung conclusion and our industry experts assert that there is no reasonable connection between the number of outfalls and the number of GRVs needed to attain a 20 percent collection standard.

EPA must explain several inconsistencies in its analyses. First, a number of the airports in Table 11-3 operate more than one GRV. For example, Buffalo International Airport (Airport 6), with five outfalls, indicated in its questionnaire response that it has two vacuum trucks and provided capital costs of \$610,000 to reflect those two trucks. Portland International Airport (Airport 5) also has two GRVs and has five outfalls. Meanwhile, Milwaukee's General Mitchell International Airport (Airport 1) operates four GRVs and, while permitted for three outfalls, actually only discharges through one. These data clearly show there is no relationship between the number of GRVs operated and the number of outfalls. Rather the number of GRVs needed is a function of such factors as area to be deiced, the number of concurrent operations, the number of gates where operations are occurring, and fleet mix, to name a few.

Second, the airports in Table 11-3 do not rely solely on GRVs to collect spent ADF. For example, Cincinnati/Northern Kentucky International Airport (Airport 3) (two outfalls) operates one GRV; however, the airport also operates an extensive deicing pad system through which it complies with its current NPDES stormwater permit. Cincinnati's GRV has little to no impact on its ability to meet its compliance requirements. The airport would have to operate many GRVs in order to collect what it current achieves through its deicing pad system. Buffalo (Airport 6) also relies on an apron collection system in addition to its two GRVs. Clearly, EPA has relied on airports with GRVs *and* another collection technology to assert the capabilities of a GRV-only technology option. Such an analysis, besides being unrealistic, provides EPA with the cost benefits of costing only a GRV (skipping the costs of multiple GRVs and additional collection systems) while enhancing the performance and environmental benefits of an otherwise unproven model technology. Such an approach is arbitrary and capricious.⁴²

⁴² There is no further reason to expand on EPA's GRV/deicing outfall theories described in the TDD, but we point them out for additional support of our assertions: "EPA assumed that the number of deicing outfalls would be an approximation of the size of the deicing area; more deicing outfalls would indicate a larger deicing area and increased costs associated with removing ADF from that area." There is absolutely no basis for this assumption. In fact, if we apply this assumption to the airports in Table 11-3, we would find that Cincinnati, which is estimated by EPA to use 715,936 gallons of ADF with only two outfalls, would incur GRV capital costs of only \$246,330. In comparison, Portland, which is estimated to use 112,046 gallons of ADF annually with five outfalls, would incur capital costs of \$615,825. Practical experience tells us that the number of GRVs needed is less a direct relationship to the number of outfalls, and more a function of a variety of factors such as the amount of ADF applied, the size of area served, type of GRV(s) used, and the existence of other collection infrastructure. EPA's connection solely between number of outfalls and number of GRVs (via cost), is neither fully explained nor supportable.

EPA also falsely assumes that the number of GRVs used is directly proportional to amount of fluid that can be collected.⁴³ Airports have actually found that there may be an optimal number of GRVs for spent ADF collection at a particular airport, above which additional fluid collection is not cost-effective.

EPA does not account for the fact that mobile collection technologies are not, in all cases, “available.” First, GRVs require significant operation and maintenance, and when they break down airports cannot always immediately repair and return them to service. This is particularly problematic if you only have one GRV. Because the need to conduct deicing activities is dictated by weather, an airport cannot simply reduce or cease deicing if one or more GRVs is not available due to mechanical problems. Obviously, airports that rely on one GRV would have to stop all operations during a deicing event should the GRV break down or risk violating EPA’s ELG standard, if finalized.

To account for mechanical problems, airports subject to the 20 percent collection requirements would need to purchase at least one “back-up” GRVs in order to ensure compliance. EPA has not costed the 20 percent collection standard with any such consideration in mind.

(3) EPA Should Not Require Immediate GRV Deployment

In the Proposed Rule EPA requires that “ADF collection by GRV shall commence as soon after deicing activities begin.” Such a requirement presents significant safety and operational impacts and is not possible in all operations. It is illogical for GRV collection to commence at the same time as deicing activities because there is nowhere for the GRV to operate until the aircraft has left the vicinity in which it was deiced. Continuous deicing may occur in a designated location until all aircraft have been deiced. It is not practical to require the deployment of a GRV for fluid collection in between the deicing of each aircraft. Coupled with aircraft, deicing trucks, and marshallers, the introduction of yet another mobile vehicle within the limited deicing area during winter weather conditions becomes a significant safety issue. It would also present operational challenges, adding substantial delays by forcing aircraft to wait for GRV collection to conclude after each previous aircraft is deiced. Requiring the immediate deployment of GRVs for ADF collection is simply impractical and should not be included in the Proposed Rule.

(4) EPA Should Not Require the Use of an Emulsifier.

EPA mandates the use of emulsifiers to theoretically enhance ADF collection. Industry experience, however, reveals that emulsifiers do not improve the collection performance of GRVs compared to clean water.⁴⁴ Thus emulsifier use is no longer standard industry practice. Requiring emulsifiers is merely an additional expense providing no additional environmental benefit. More importantly, emulsifiers represent an additional environmental threat that seems to contradict the intent of the Proposed Rule. Emulsifiers present concerns about toxicity, odor, and foam, to name a few. Quite possibly, their use would trigger additional permitting obligations and requirements from state permitting authorities that EPA has neither considered nor costed in its analyses. EPA cannot justify emulsifier addition as BAT.

⁴³ U.S. EPA, Economic Analysis for Proposed Effluent Limitation Guidelines and Standards for the Airport Deicing Category (hereinafter EA) at 4-2 (July 2009).

⁴⁴ Pers. Comm., Mike Svedruzic, Inland Technologies.

3. Deicing Pads Cannot Meet a 60 Percent Collection Standard Representing BAT.

For airports using 460,000 gallons or more of normalized ADF annually, EPA has identified centralized deicing pads as BAT for collecting 60 percent of available ADF. The proposed requirements are problematic for a number of reasons. Overall, EPA has failed to demonstrate that 60 percent collection is either economically or technically achievable at all airports, either through use of deicing pads or any other technology. At many of the airports potentially subject to 60 percent collection requirements, the installation of deicing pads is impossible and at others it may only be possible through significant operational and financial burden. EPA must address these serious practical and economic limitations associated with the proposed deicing pad mandates.

a. EPA Fails to Justify its Conclusion that Deicing Pads Represent BAT and Meet a 60 Percent Collection Standard.

EPA assumes that collection efficiency is a function of how effectively the system is operated (EPA “estimates that facilities *effectively operating* a centralized deicing pad recover 60 percent of applied glycol.”⁴⁵ (emphasis added)). While in theory or in tightly controlled conditions that may be true, a number of factors beyond operational effectiveness influence the collection efficiency of a deicing pad system. Among these, one of the most important factors is weather, which is beyond the control of even the most effective deicing pad operator. While deicing pads can be designed to meet specific collection requirements, their ultimate collection efficiency is greatly impacted by weather.

EPA also provides no further guidance or definition as to what qualifies as “effectively operating.” If EPA intends that the technical specifications set forth in 449.20(b)(1)(ii) constitute EPA’s perceived definition of “effectively operating,” then the Agency must provide additional explanation and support the basis for those specifications before finalizing the standard. We cannot identify any justification for a conclusion that airports relying solely on those specifications will collect 60 percent or more of available ADF and achieve full compliance with the proposed standard.

b. Not All Airports Can Implement Deicing Pads, and EPA Has Not Identified an Alternative Technology to Achieve the Standard.

EPA is obligated to identify a model technology that will achieve the standards that it promulgates. Target facilities are not obligated to use that technology to comply with the standard if other technologies exist. In the Proposed Rule, EPA identified deicing pads as its model technology, but not all airports can reconfigure their sites to adopt the deicing pad technology while meeting operational and safety requirements. In addition, EPA has not identified any other technology that meets the 60 percent standard. Hence, airports that cannot build pads are facing significant compliance and liability issues.

⁴⁵ TDD at 9-5.

As discussed in section II.C.10.b, some airports are so land constrained that it is impossible to install deicing pads, or even if theoretically possible, the resulting operational impacts would so affect service or the economic impacts would be so severe as to make pursuing them completely impracticable. In fact, any change to an airport layout plan (ALP) would require FAA approval to ensure operational, safety, design and other FAA requirements are being met. FAA simply will not approve construction of any deicing pad that compromises these requirements.

At other airports, operational constraints alone may eliminate deicing pads as an option for collecting spent ADF. At Chicago O'Hare International Airport (ORD), one of the busiest airports in the world, deicing pads cannot meet the consistent operational demand. This reality was noted in EPA's site visit report for ORD: "In the mid-1990s, the [Department of Aviation] DOA considered installing aircraft deicing pads at ORD, but concluded that the very high number of operations made aircraft deicing pads impractical for ORD."⁴⁶ Many airports have analyzed the feasibility of installing deicing pads to collect spent ADF. Where deicing pads could be effectively employed, they have been installed. However, the fact that airports such as ORD studied and dismissed deicing pads as a feasible option because of operational or other constraints indicates that deicing pads are not always an available option.

If any single analysis represents EPA's overly simplistic approach to this proposed ELG, EPA's February 7, 2008 memorandum, "Estimated Deicing Pad Areas and Deicing Pad Space Evaluation," serves as a prime candidate. This memo demonstrates a complete lack of understanding of airport operations, existing airport design needs, and the potential for EPA to cripple national air service through this proposed regulation. The analyses in this memo are fatally flawed for a number of reasons.

As the memo itself admits, EPA (and its contractor) did not have sufficient information to evaluate airport ground traffic patterns at the selected locations for deicing pads. This lack of information is, in our opinion, a significant flaw in the analysis and EPA's decision to proceed with this proposed regulation without pursuing additional information is unconscionable. Appropriate information could easily be obtained via interviews with airport and FAA Air Traffic Organization representatives at those airports. Through a few phone calls, EPA could have identified common aircraft taxiing patterns and established whether proposed sites could reasonably be converted to deicing pads (which they could not). For example, such discussions would have likely eliminated all three of EPA's proposed deicing pad sites at LaGuardia from further consideration because the taxiways within these areas are essential for the staging and sequencing of aircraft departures and for access to aircraft parking aprons.

EPA also could have analyzed historic weather and airport operations data to determine which runway use configurations are most commonly associated with snow and icing events. Such analyses are essential to effectively siting deicing pads near the runway ends that are most likely to be used by departing aircraft during snow and icing conditions. Such an analysis is a more appropriate way to determine the number and size of deicing pads that would be needed at an airport than EPA's averaging/ratio method outlined in the memo. In some cases, these analyses may indicate only a single pad is needed; in other cases, due to variability in wind conditions in

⁴⁶ U.S. EPA, Final Engineering Site Visit Report for Chicago O'Hare International Airport Chicago, IL., EPA-HQ-OW-2004-0038-0524 at 7 (2008).

snow and icing conditions, it may be useful to have deicing facilities located at or near multiple runway ends. The memo lacks a sophisticated understanding of key issues including weather-related impacts to taxiing/take-off/landing, appropriate sizing/configuration of pads for appropriate usage, and other basic analyses any airport and FAA would demand as part of a “deicing pad implementation analysis.”

The available sites for deicing pads identified in the memo also do not consider critical airport design criteria, including runway safety and object free areas, obstruction clearance criteria, navigational aid critical areas, and navigational aids themselves. The size and shapes ascribed to these areas are accordingly grossly overstated. EPA’s proposed deicing pads near the departure ends of LaGuardia’s Runways 4, 31, and 13 are shown adjacent to runway edges, which would be impermissible under FAA design criteria. Moreover, the pads shown near the departure end of Runway 13 would interfere with taxiways that are critical to the staging and sequencing of departures during non-icing conditions. We would expect that EPA would coordinate with the airport and understand FAA deicing pad requirements prior to proposing their use. At the very least, EPA should have interacted with FAA staff regarding this type of issue. Based on our discussions with FAA staff, they were asked by EPA to review the entire Proposed Rule on an expedited basis (less than a week) immediately before EPA sought to publish the proposal. This certainly did not allow FAA adequate time to fully analyze the implications of the proposal, and we anticipate FAA will further address its concerns through formal comments.

Further, replacing these taxiways with a deicing pad would almost certainly have considerable adverse operational consequences during the substantial part of the year when deicing is not needed at an airport that consistently ranks among the three most delayed airports in the country. Similarly, the hypothetical pad near the departure end of Runway 31 would block access to two airport terminals--US Airways and Delta--as well as the runway end itself. The hypothetical pad near the departure end of Runway 4 would be impermissibly located within instrument landing critical areas and would preclude use of Runway 4 for approach when in use. Similar issues exist with the hypothetical pad sites proposed for JFK and DCA. In the case of JFK, the proposed pad location would also require crossings of Runway 4L-22R, which could have significant adverse consequences on airfield safety during winter weather conditions.

It should be noted that none of these types of conditions exist at the three example airports cited in the memo (PIT, DEN, and DTW), where deicing pads are located well outside of movement areas, with appropriate, safe setbacks from active taxiways and runways in ways that do not interfere with airfield circulation or navigational aids. Also, in none of these cases did deicing pads displace needed taxiway infrastructure.

EPA’s reliance on this memo to determine that the proposed collection technology is widely available to the industry, particularly land constrained airports, is without merit. As described above, determining the appropriate number, size, and location of airport deicing pads cannot be reduced to a simple formula. In fact, a more thorough analysis would show deicing pads are not an available technology at most land constrained airports or are not available to an extent that would meet the proposed collection requirements. EPA states in the preamble that based on its reliance on the analysis in the February 7, 2008 memo that land constrained airports have sufficient land to install the necessary collection technologies, “economic achievability is the

controlling factor in identifying which option represents BAT for collection of ADF.”⁴⁷ We adamantly disagree.

The proposed hypothetical pads do not appear to have been laid out with any consideration for how aircraft would enter and exit the pads. Again at PIT, DEN, and DTW, the pads were designed specifically to accommodate "pull-through" use of the pad which is the most effective and efficient way to utilize such pads. The orientations of the hypothetical pads that are shown for DCA, JFK and LGA do not appear as though they would permit pull-through use, which would reduce the capacity of these pads considerably and increase the overall pad size required for deicing operations.

The memo’s analysis also completely disregards any existing airport master plans and future development needs.

c. EPA’s Proposed Deicing Pad Specifications Are Unrealistic.

The Proposed Rule provides technical specifications permitting authorities could force on airports to demonstrate compliance with the 60 percent collection standard. The proposed specifications are unrealistic and fail to account for FAA’s existing deicing pad design guidance. EPA has not provided information to demonstrate that (1) these specifications are being met by any airport currently relying on deicing pads to collect spent ADF, (2) these specifications are achievable at any airport proposed to meet 60 percent collection requirements, or (3) that meeting these specifications will ensure collection of 60 percent of available ADF.

Unless EPA can demonstrate that an airport will comply with the proposed ELG through forced implementation of the section 449.20(b)(1) specifications, the Agency should not prescribe such a mandate. Further, EPA cannot prescribe a single compliance technology through the ELG program, either on its face or in practice (through the lack of alternatives). This issue is addressed further in section II.J.2 on Permit Writer Discretion.

(1) EPA Has Not Clearly Defined “Centralized Deicing Pad.”

EPA has proposed that an airport can demonstrate compliance with the 60 percent collection requirements by operating a “centralized deicing pad” in accordance with technical specifications set forth in section 449.20(b)(1)(ii). However, EPA has not made clear whether only centralized deicing facilities would meet the proposed requirements. FAA has established standards, specifications, and guidance for designing aircraft deicing facilities: Advisory Circular 150/5300-14B. In the AC, FAA specifically defines a centralized deicing pad as “an aircraft deicing facility located at the terminal gates/aprons or along taxiways serving departure runways.”⁴⁸ Separately, FAA defines a remote deicing facility as “an aircraft deicing facility located along taxiways serving departure runways or near the departure end of runways.”⁴⁹ Because EPA is setting a legal standard through the proposed ELG, we must take EPA’s use of “terms of art” (i.e., “centralized deicing pad”) to mean that EPA is prescribing only centralized deicing pads as FAA and the industry understand that term to mean.

⁴⁷ 74 Fed. Reg. at 44,692.

⁴⁸ FAA Advisory Circular 150/5300-14B, Design of Aircraft Deicing Facilities at 1 (2008).

⁴⁹ *Id.*

While centralized pads can necessitate increased use of Type IV fluids to maintain holdover times, Type IV fluid is generally uncollectable and may increase the load generated in "non-deicing" areas. Conversely, building remote pads large enough to service full departure banks at each end of all possible winter departure runways at an airport would be grossly expensive. Detroit Metropolitan Wayne County Airport, for example, utilizes three types of pads: remote - threshold departure (most efficient); centralized - departure from each end (less efficient); and remote - opposite end departure (the most difficult, but the only way to use all four of the airport's pads simultaneously during bad weather). Therefore, in order to best accommodate their deicing and operational needs, airports may rely on a combination of centralized and remote deicing pads. While EPA considers DTW to meet BAT and the Agency has relied on DTW to determine pad costs elsewhere, EPA has not fully considered or costed centralized deicing pads versus remote deicing pads or any combination thereof. If EPA is proposing alternative systems, then it must modify the proposal and explain that issue. EPA must use nomenclature to be consistent with FAA's and industry standards.

(2) EPA Ignores Existing Deicing Pad Design Guidance.

FAA AC 150/5300-14B provides standards, specifications, and guidance for designing aircraft deicing facilities. While the AC does not constitute a "compliance" regulation per se, airports relying on Airport Improvement Program (AIP) or Passenger Facility Charge (PFC) funding for aircraft deicing facilities must adhere to its standards. The AC includes detailed guidance for determining the appropriate size, location, environmental, and operational needs to be considered in the design of aircraft deicing facilities while maximizing deicing capacity, safety, and operational efficiency. In the Proposed Rule, however, EPA has inaccurately condensed this 31 page technical AC into a few sentences of required specifications. In doing so, the Agency has over-simplified a complicated, site-specific planning decision, ignoring critical safety and operational considerations. EPA has created a "no-win" situation in which airports achieve compliance with EPA's proposed standards and forfeit AIP or PFC funding, or violate EPA's standards (potentially creating criminal liability) to meet FAA's standards. This is unconscionable.

While some of EPA's proposed specifications parallel existing FAA guidance (e.g., pad length and width), other FAA standards are either ignored by EPA or are altered in EPA's prescription. For example, EPA requires that facilities be sized to accommodate the airport's peak hourly departure rate, whereas FAA guidance states that "airports should have deicing facilities with a deicing/anti-icing capacity that approximates the airport's peak hour departure rate *that the [air traffic control tower] can manage during icing conditions.*"⁵⁰ This is a critically important distinction in sizing deicing facilities.

Additionally, EPA does not address the fact that safety and operational factors may limit an airport's ability to site deicing pads in many locations on the airfield. FAA guidance focuses on the fact that safety and operational needs are paramount to the design and operation of a deicing pad system. The AC specifically states that "[s]afe and efficient aircraft operations are of

⁵⁰ *Id.* at 4.

primary importance in the development of any aircraft deicing facility.”⁵¹ The AC recognizes the importance of “designing a [deicing] facility that is efficient and offers users operational flexibility.”⁵² EPA makes almost no effort to account for the safety and operational considerations associated with the design of deicing pads. EPA cannot possibly conclude that deicing pads are technologically achievable at all airports without taking into account the type of safety and operational limitations recognized by existing FAA guidance. In fact, because of these limitations, FAA may prohibit or restrict their construction in many locations.

Overall, FAA AC 150/5300-14B is the standard reference for centralized deicing facility specifications. If EPA believes changes to that document are necessary, they should be coordinated with FAA, rather than force a confrontation through competing regulations in which airports are stuck in the middle.

(3) EPA Should Not Establish Deicing Pad Sizing Specifications.

In sections 449.20(b)(1)(ii)(D) – (F), EPA proposes technical specifications regarding the size of a deicing pad required to demonstrate compliance. First, as written, an airport could construct only one deicing pad in order to demonstrate compliance with the Proposed Rule. At many airports, multiple pads may be necessary in order to meet safety and operational needs. It may be preferable to construct multiple pads of varying size in order to accommodate different aircraft sizes. Depending on the airfield configuration, available space, and operational needs, multiple smaller pads may offer more efficient deicing operations compared to a single larger pad. EPA’s single pad approach again demonstrates its unsophisticated knowledge of and approach to deicing issues pervasive in its Proposed Rule.

Those airports that may be subject to 60 percent collection requirements under the Proposed Rule (i.e., airports where 460,000 gallons or more of ADF is applied annually) undoubtedly face significant operational demands, which require more than one deicing pad. In fact, none the airports EPA has projected to already meet the 60 percent collection requirements currently rely on a single deicing pad. Again, EPA has not demonstrated that any airport relying on the specifications proposed, let alone using a single deicing pad, can collect 60 percent of available ADF. Further, EPA has not demonstrated that an airport with such a large number of operations, prompting the need to apply over 460,000 gallons of ADF annually, can rely on a single deicing pad to meet the proposed collection requirements.

In a supporting memo on determining the feasibility of constructing and operating deicing pads at land constrained airports⁵³, EPA crafted a rationale for determining the number and size of deicing pads necessary at airports subject to 60 percent collection requirements. This rationale is an overly simplistic formula. First, a single deicing pad is unlikely to suffice for the operational needs of airports using significant amounts of ADF. EPA recognizes that Pittsburgh, Denver, and Detroit Metro International Airports – those that EPA attests already can meet the standard

⁵¹ *Id.* at 1.

⁵² *Id.*

⁵³ Memorandum, Estimated Deicing Pad Areas and Deicing Pad Space Evaluation, EPA-HQ-OW-2004-0038-1171 (February 2008).

through pads – rely on five, four, and four deicing pads, respectively. Second, EPA is mistaken in creating a metric that relates the number of deicing pads necessary to the number of runways.

EPA is also mistaken to relate the number of deicing pads necessary to the number of annual departures. Such considerations require site-specific analyses that are necessary to effectively size and site deicing pads. Such considerations include facility layout, historical weather data, and airport operations information to determine which runway use configurations are most commonly associated with snow and icing events. Such analyses are essential to effectively siting deicing pads near the runway ends that are most likely to be used by departing aircraft during snow and icing conditions. Finally, there is no explanation regarding the deicing pad size specifications set forth in the Proposed Rule, a reasonable comparison of EPA's analyses to FAA's or real world deicing pad planning, and the necessary justification that demonstrates that any such proposal will in all instances achieve 60 percent collection.

In summary, the size, number and location of deicing pads are such site-specific determinations that EPA should not establish rigid specifications in the Proposed Rule. Airports need the flexibility to work with airlines to determine the optimal deicing management system design parameters that will meet that location's environmental, safety, and operational needs. FAA's AC 150/5300-14B provides established specifications for these facilities, and any deficiencies that EPA believes exists in those specifications should be addressed as changes to the AC, rather than a separate set of requirements. In the end, however, EPA cannot demonstrate that its model technology is workable or will achieve EPA's desired outcome.

(4) EPA Confusingly Mixes Design and Operational Specifications.

In proposed section 449.20(b)(1)(ii), EPA sets forth technical specifications for the “[o]peration of a centralized deicing pad collection system”(emphasis added). This language actually contains a combination of design requirements and operational requirements. The first three specifications could be considered operational in nature, addressing where deicing must take place and the need to activate drainage valves before deicing. However, the other four specifications address design parameters, not operational technique. The size of the deicing pad and the requirement to equip the pad with a fluid collection system relate to how the pad is initially designed and constructed. These specifications cannot be altered through operational means. As we will later discuss, EPA should not establish specifications for sizing a deicing pad system.

As an alternative compliance method, EPA allows “[t]he use of the same technology, but with different specifications for operation and maintenance.”⁵⁴ It is unclear whether different design/construction specifications may be used or if all specifications may be different.

⁵⁴ Proposed 40 CFR 449.20(b)(2)(i)(B).

4. EPA Should Not Require That All Deicing Be Conducted in Areas with Active Collection.

EPA has proposed to require that all deicing activity should occur where ADF is actively collected by GRVs or deicing pads with an exception for deicing for safe taxiing. As long as an airport is meeting its percent collection requirement, we fail to see why deicing would have to occur where collection activities take place. Such a requirement will pose significant and unnecessary operational impacts.

For limited purposes, it may be necessary to deice an aircraft away from a deicing pad or GRV collection area. For example, it may not be reasonable to require certain types of operations such as general aviation and cargo to deicing at centralized pads, particularly because those aircraft generally operate out of separate areas of the airport, away from main terminals. Further, morning defrosting activities are typically conducted before passengers even board aircraft to ensure flights are prepared for immediate departure during this busy, peak traffic time. As proposed, aircraft would have to taxi to a centralized pad for defrosting, then return to the gate to board passengers, luggage, cargo, fuel, and catering. Otherwise, a significant number of aircraft would require simultaneous defrosting immediately before departure. Both options have significant unintended consequences, environmentally and operationally. As long as an airport is complying with the imposed percent collection requirements, we fail to see the benefit of this specification, which may ultimately impart significant impacts on aircraft operations.

5. EPA Should Not Limit Deicing for Safe Taxiing.

EPA has proposed to limit the volume of ADF to be used for safe taxiing to 25 gallons. While EPA apparently based this provision on a similar limit in place at Denver International Airport (DEN), the Agency failed to demonstrate a substantive basis for the limit. EPA also did not take into account the safety implications associated with establishing such a limit. Additionally, it is unclear whether the deicing associated with safe taxiing is exempt from the collection requirements.

The existence of a similar “limit” at one airport should not be relied on for general applicability across the industry. Site-specific considerations will dictate the amount of ADF necessary to safely taxi to designated deicing locations. The DIA limit is based on an unsubstantiated estimate of the quantity of ADF one airline indicated to the airport may be necessary for application prior to taxiing to the deicing pads. DIA is located in a semi-arid climate with deicing pads located near terminal area points of egress. The apparent sufficiency of the application of 25 gallons of ADF to allow an aircraft to safely taxi to Denver’s deicing pads is not necessarily indicative of the quantity of ADF necessary to allow an aircraft to safely taxi at an airport in a more humid climate or with remote deicing facilities. In the end, however, EPA never checked analyzed the basis of this provision, how it is enforced there, or how airlines may react to such a requirement. It would appear that EPA found something obscure that was appealing from a regulatory perspective and merely plugged it into their proposal without fully understanding the ramifications or impacts on airport operations and safety.

More importantly, decisions relating to the quantity of fluid usage necessary to ensure safe operations are most appropriately left to the air carriers, and ultimately the pilots, based on their FAA plans, aircraft type, safety considerations, and weather conditions. Safety is a critical aviation issue which airports should not be held liable or responsible for in meeting effluent limitation guideline requirements. In this context, EPA is setting up a separate “no-win” decision between passenger safety and environmental compliance, recognizing that any such conscious decision potentially exposes the decision-maker to civil or criminal liability.

EPA also has not distinguished whether the deicing fluid applied for safe taxiing is considered available for collection or exempt from the airport’s applicable collection requirements. Because such fluid is applied in limited quantities where collection may not occur, it should not be factored into the airport’s collection efficiency.

6. EPA Has Not Analyzed the Operational and Safety Implications Associated with GRV and Deicing Pad Use.
 - a. EPA Must Address the Operational and Safety Implications of GRV Use.

There are significant safety and operational implications associated with the use of any mobile collection technology. Ensuring safe airfield operations is of paramount importance to airports. To help ensure safe operations, airports develop specific operating procedures and training programs relating to vehicular operations in the airport operations area (AOA). As a general principal, minimizing the number of mobile equipment and vehicles utilizing the AOA contributes to safer operations. This is particularly true in deicing conditions, where winter weather and the associated reduced visibility further contribute to the safety risk for vehicular operations. As proposed by EPA, many airports will need to stage and operate mobile collection equipment in the AOA in order to meet the 20 percent collection requirements. For some airports, multiple GRVs or similar equipment may be required. The potential for the operation of mobile glycol collection equipment in an already active and congested area, particularly during winter weather conditions, to compromise airfield safety must be taken into consideration.

The use of mobile collection technologies may also impact aircraft operations. The configuration of many airports results in extremely space-constrained gate areas. Because of safety requirements, aircraft may not be able to park or push back while aircraft at adjoining gates are deiced and spent fluid is subsequently collected. Additionally, other critical equipment such as fueling trucks and baggage carts may not be able to access the area, even at adjoining gates. The proposed requirement to deploy GRVs as soon as deicing begins will further impact operations. The effects of EPA’s proposal may significantly impact the operational efficiency of the airport, and the associated cost impacts should be quantified. EPA does not appear to have accounted for or analyzed these operational implications or the costs associated with those implications.

b. EPA Must Address the Operational and Safety Impacts of Deicing Pads.

EPA mistakenly assumes “workable solutions” to the operational complexities associated with deicing pads are available because many airports have installed pads.⁵⁵ While pads may function successfully at a number of airports, there are many airports at which the required installation and use of deicing pads would have significant operational and safety impacts, preventing their effective use. Moreover, as previously discussed, several airports lack sufficient land area to accommodate deicing pads at all. In determining that deicing pads are technologically available and economically achievable, EPA brazenly dismissed those impacts and their associated costs.⁵⁶

Deicing pads are not operationally feasible at many airports for a number of reasons. Deicing pads may not be able to accommodate high departure rates at busy airports with multiple runways. The number of aircraft that can be deiced at once is limited by deicing pad space available. This limitation can cause a choke in operations, significantly impacting airlines, passengers, and the entire airspace system. As previously discussed, airports such as Chicago O’Hare International Airport have considered and dismissed deicing pads as a viable collection technology for spent ADF based solely on the resulting operational impacts.

Because of airfield layout, available space, FAA safety restrictions, and other factors, ideal pad locations may not be available or authorized by FAA. Alternative locations can require additional taxiing, limited pad capacity, and possible safety implications. Airports may have to construct deicing pads in locations that require aircraft to cross active runways, creating additional operational and safety impacts that are further exacerbated by winter weather conditions initially prompting the need to deice.

Assessment of the operational impacts associated with the potential installation of deicing pads at the particular airports subject to the 60 percent collection requirements is critical to determining their technological availability. At a minimum, this assessment should consider (1) the proposed location of the deicing pads, (2) aircraft taxiing routes to and from the pads for all major runway use configurations that occur during deicing conditions, (3) the magnitude of aircraft and passenger taxiing delays and congestion associated with deicing pad use, and (4) the number of additional aircraft and deicing vehicle runway crossings associated with deicing pad use.

As proposed, EPA estimates a limited number of airports may be required to collect 60 percent of applied ADF based on the use of deicing pads. According to EPA’s data, fourteen airports use more than 460,000 gallons of ADF, subjecting them to the 60 percent collection standard. EPA also assumes half of these airports already meet the collection standard because they currently use deicing pads. By EPA’s determination, seven airports may have to install deicing pads to meet the requirements of the Proposed Rule – four of which are highly-delay prone airports in the Northeastern US. It is a blatant analytical failure and obvious oversight for EPA to ignore the operational impacts associated with the installation and use of deicing pads at a mere seven

⁵⁵ EA at 4-3.

⁵⁶ The need to consider the costs associated with operation impacts is discussed in section II.G.1.

airports. EPA did not so much as discuss, let alone analyze these operational impacts. EPA must consider the operational (and associated cost) impacts of deicing pads.

This issue is exacerbated by the NSPS standards that will require many more airports to have to implement centralized deicing pads to achieve the NSPS standards. EPA must consider this other subset of airports in all of its analyses before finalizing any proposed rule.

7. Alternative Means of Complying With The Proposed Collection Requirements Are Not Available.

a. EPA Falsely Assumes Airports Can Contract Out Fluid Collection and Disposal.

EPA concludes that “[f]or airports that occasionally deice aircraft primarily to remove frost, installing permanent collection and treatment equipment for spent ADF would not be practical.”⁵⁷ We whole-heartedly agree with this conclusion.⁵⁸ However, EPA then unreasonably assumes that these airports will rely on an outside glycol recovery service to collect and remove the limited ADF applied. The availability of a contracted glycol recovery service cannot be relied upon in requiring airports that occasionally deice to collect spent ADF.

EPA relies on a supporting memo describing a method for estimating the cost of collecting a certain volume of deicing fluid using a contractor GRV service. Mobile glycol collection equipment is specifically designed to collect spent deicing fluid and is not of general use or applicability in other industries or for other services. Because the airports using small amounts of ADF are generally located in areas where frozen winter precipitation rarely, if ever, occurs, it is unlikely that a glycol recovery service will exist within the immediate vicinity. EPA cannot assume either the availability of such a service or the business case for the establishment of such a service in an area such as Southern California or Louisiana. It would be unreasonable to assume a contractor could justify the costs of purchasing and maintaining a GRV or similar equipment used so infrequently by one potential client. The use of equipment not specifically designed for deicing fluid collection (e.g., a vacuum truck) may not work as needed. Additionally, disposal will be a challenge for many small communities who may not have the capacity to handle even small amounts of high strength stormwater. EPA developed cost estimates of \$1,100 - \$6,700 per season to contract out fluid collection and disposal service at small southern tier airports based on information from one contractor. These estimates ignore the business realities of such a service.

In an area such as Southern California where numerous airports are located, the need for such a service is likely to arise at all airports at the same time. Even limited contractor service may not be able to meet the ADF collection needs of all airports simultaneously, particularly without undue delay, which, again, can have substantial operational implications. An airport would either be forced to halt operations until the contractor could arrive to collect any applied fluid or ensure another collection technology (e.g., block and pump) is in place. Such implications have

⁵⁷ TDD at 11-2.

⁵⁸ As discussed in section II.B.1, we also challenge EPA’s conclusion that ADF applied for defrosting is even available for collection.

not been considered or factored into the costs of the Proposed Rule. In the alternative, these airports should not be within the scope of any deicing ELG.

Additionally, EPA has not accounted for the safety training and security clearance considerations required for any individual permitted to operate equipment or vehicles on an airport airfield. In order to allow an individual to operate equipment or vehicles on the AOA unescorted, the individual must undergo specific safety training and background security clearances (which may take several days to clear). With such infrequent need for such a service, ensuring one or more employees has met the required training and clearance is burdensome. Additionally, the vehicle/equipment must be equipped with the appropriate lights and signage and meet specific insurance requirements of two to 10 million dollars. Meeting these requirements is onerous and costly, and EPA has not accounted for these costs in the Proposed Rule. More importantly, the requirements may inhibit a company from doing business with an airport, particularly for such infrequent, “on demand” service.

As an alternative, and as would more likely occur, if the individual has not met the training and security requirements, the airport could escort the vehicle while on the AOA. In such situations, an airport employee would be required to continuously escort and monitor the individual and equipment at all times. This option requires staff time and resources, which EPA also has not accounted for in estimating the costs of the Proposed Rule.

b. Alternative Technologies May Not Allow 60 Percent Collection.

EPA has identified centralized deicing pads as the best available technology economically achievable for collecting 60 percent of available ADF. As discussed above, we contest EPA’s conclusion that deicing pads can consistently achieve 60 percent collection. Further, we dispute EPA’s conclusion that deicing pads are “available” at all airports. Finally, EPA has not shown that deployment of either another technology or deicing pads using different technical specifications will allow an airport to achieve 60 percent collection.

In section 449.20(b)(2), EPA proposes to allow the use of a different ADF collection technology in lieu of deicing pads. We appreciate EPA’s intention to accommodate the varying needs and abilities of airports by allowing alternative methods of compliance. For a wide variety of reasons, deicing pads may not be a viable ADF collection technology at many airports. Most notably, space constraints and operational impacts often prevent or limit an airport’s ability to rely on deicing pads. However, for those airports unable to rely on deicing pads, EPA has not provided any alternative technology that it asserts would be capable of achieving the required 60 percent collection efficiency. Because, as previously discussed, deicing pads are not available at all airports subject to the 60 percent collection requirement and no alternative technology has been shown to allow an airport to achieve 60 percent collection, EPA has not shown that the 60 percent collection requirement is achievable at all airports that will be subject to the requirement.

E. EPA’s Proposed Treatment Standards Must be Reconsidered and Revised.

EPA has made numerous errors in the underlying assumptions and analyses of its model treatment system – Anaerobic Fluidized Bed (AFB) treatment – that must be corrected if EPA pursues final Airport Deicing ELGs based on its proposal. Towards that end, EPA would have to

clarify the scope of the treatment mandate, correct its analysis to account for the differences between “total” and “soluble” COD, address typical and expected variability from highly different operations under significantly different weather conditions, and rely on data from more than one or two, arguably not-representative airports. Overall, EPA’s analyses of the AFB treatment system more closely resemble an analysis of a more traditional wastewater treatment system from manufacturing; the type of systems EPA historically has regulated through ELGs. For this rule, EPA must modify its analyses to address significantly more important variables including different types of deicing operations at different sized airports, different weather patterns that impact influent waste concentrations, and other aspects of the airport industry that are absent in EPA’s Proposed Rule. Failure to properly account for these issues would expose a final rule to technical and legal challenge.

1. EPA Must Clarify the Scope of the Proposed Treatment Standards.

a. EPA Must Clarify If All Collected ADF Must Be Treated.

EPA has proposed treatment limits that “must be met for all ADF collected pursuant to paragraphs (a) and (b) of this section” (referring to the proposed 60 and 20 percent collection requirements). This could be interpreted to mean that only discharges of ADF required to be collected would be subject to the proposed COD limits. Therefore, if an airport is subject to 20 percent collection requirements, but actually collects 30 percent of available ADF, only discharges of the required 20 percent would be subject to the COD limits.

In the same subsection, however, the Proposed Rule states, “Except for ADF collected and transported to off-site treatment facilities, any existing point source subject to this part must achieve the numeric effluent limitations....” This language seems to imply that any discharges of ADF-impacted runoff would be subject to the proposed COD limits. Therefore, an airport subject to the 20 percent collection requirements that actually collects 30 percent would have to meet the COD limits for all associated discharges. EPA must clarify whether all collected ADF must be treated or only the ADF collected pursuant to the applicable requirements.

Regardless of EPA’s clarification, this issue highlights the inherent pollution prevention disincentive the proposed regulatory structure creates. Airports are discouraged from collecting any additional ADF beyond that required because of the additional storage and treatment capacity and costs associated with having to treat more ADF than is required to be collected.

b. EPA Must Clarify That Only Discharges to Surface Waters Are Subject to the Proposed COD Limits.

The Proposed Rule imposes COD limits on collected ADF runoff, “Except for ADF collected and transported to off-site treatment facilities...” Yet, in the preamble, EPA explains that the treatment standards are intended to apply unless runoff is sent “to a POTW or commercial treatment/recycle facility.” While we believe EPA intended for discharges to a POTW to be exempt from the treatment requirements, that intention should be clarified in the proposed regulatory language.

Further, EPA has not identified where the proposed COD limits would apply. Logically, EPA may have considered the “end-of-pipe” COD limit to apply at the discharge from the treatment system (AFB for example) employed by the airport. However, technically, “end-of-pipe” would be considered at the point at which the discharge leaves the permittees property or enters a water of the U.S. (if on site). Several issues may complicate this issue. First, if EPA allows compliance at the discharge from the “treatment system,” then what about airports that use ponds or treatment devices that are less obvious than an AFB system. Where would they measure compliance? Next, if EPA would measure compliance at the point source discharge, what about the situation in which a discharge from an AFB system that is within the COD standard then picks up non-ADF-based COD between the AFB discharge and the airports point source discharge such that it no longer meets the proposed standard? The airport will have met the limit for collected ADF, but not measured at the “end-of-pipe” discharge. EPA must clarify and address these issues.

2. EPA Must Reconcile Whether Its Treatment Standard and Underlying Analyses Address Total COD or Soluble COD.

In the Proposed Rule, EPA sets chemical oxygen demand (COD) limits of 271 mg/L daily maximum and 154 mg/L weekly average in effluent discharged from treatment systems to surface waters. Throughout the Proposed Rule and supporting documents, the limits are based on Anaerobic Fluidized Bed (AFB) model technology, and are described simply in terms of COD without explaining whether the basis for that measurement is Total COD or Soluble COD, an important distinction. EPA must clearly explain whether total or soluble COD data were used as the basis for establishing the COD limit and whether Total or Soluble COD is the intended effluent limit parameter. In addition, the difference between these two parameters must be reconciled in EPA’s analyses.

The key issues regarding whether EPA intended to regulate Total or Soluble COD include:

- The effluent data from the ALB AFB used by EPA were Soluble COD
- The selection of the AFB as BAT by EPA appears to be based strictly on the AFB bioreactor and the systems that support the biological activity. Handling of biosolids is a separate technology, as evidenced by the ALB system, in which the solids handling systems are not directly connected to the AFB. No reference is made to solids handling systems in the Proposed Rule.
- If the effluent limit were specified in terms of Total COD, provisions would need to be made by an airport for a solids handling system. There is no information to suggest that costs for solids handling (which are very site specific) are included in EPA cost estimates.
- The existing airports using AFB systems use Soluble COD and not Total COD to manage system influent and assess system performance. If the systems are forced to operate to meet COD limits that include the solids fraction, they may need to reduce the flow rates entering the treatment system, jeopardizing their ability to meet water quality based effluent limits, effectively reducing their available storage capacity, and increasing the risk to the environment from storage overflows.

- Local permitting authorities may base NPDES effluent limits on Total COD, instead of Soluble COD, which would impose a more restrictive discharge limit on airports than EPA may intend.

Soluble COD is the COD of liquid fraction (i.e., the fraction passing through a filter used in a suspended solids test). Total COD is the COD of the liquid fraction plus the COD of any solids in a sample. Soluble COD is the parameter used by the existing AFB systems (Albany International (ALB) and Akron-Canton Regional (CAK) Airports) to measure the performance of their AFB systems. Soluble COD is used because:

- The freezing point depressants in aircraft deicing fluids (propylene glycol, ethylene glycol, glycerin) are highly soluble. As a result, the COD in the stormwater collected from airports is almost entirely soluble. Only small amounts of suspended solids typically result from wash off of non-deicing pollutants. The draft ELG rule addresses only contaminants associated with deicing operations, not with non-deicer constituents associated with materials washed from the airport surfaces.
- Total COD concentration measurements in the treated effluent, which include measurement of the biosolids fraction, are highly dependent upon treatment system flow rate. Treatment system flow rate can be highly variable within a given AFB system and from airport to airport due to the significant variation in influent soluble COD concentration and the need to operate the AFB systems at a near constant soluble COD load.

From our analyses, EPA appears to have unknowingly used Soluble COD data to craft the proposed treatment standards. The supporting document titled “Long Term Data from Albany Airport with EPA Comments” includes the daily effluent concentrations from each of the anaerobic fluidized bed reactors at the existing ALB AFB treatment system.⁵⁹ According to this document, the values for effluent concentration are in “S COD (mg/L),” which we interpret to mean Soluble COD. We have also confirmed with individuals familiar with the ALB system that the COD measurements taken and reported in the referenced document are, in fact, in terms of Soluble COD.

EPA apparently used the Soluble COD data to establish COD effluent limits and conduct cost-benefit analyses for the Proposed Rule. This leads to a number of problems. Such analyses result in a technically inaccurate representation of ALB AFB treatment system performance and inappropriately add a solids removal requirement to the BAT. Use of “COD” alone will likely be interpreted as “total COD” by permit writers. Because EPA, in fact, used Soluble COD as its basis for development of the proposed effluent limits, EPA must have intended to propose limits in terms of Soluble COD. In the alternative, however, EPA could specify limits in terms of Total COD, but include in the derivation of such limits the appropriate non-soluble COD potentially found in airport influent (perhaps revisiting the ALB AFB). In any event, EPA must address this issue and recalculate limits one way or the other.

⁵⁹ U.S. EPA, Long Term Data from Albany Airport with EPA Comments, EPA-HQ-OW-2004-0038-0712 (April 2008).

Failure to make this change would be technically inconsistent and extend the basis for the treatment BAT from only the AFB unit itself to the biosolids handling system. The biosolids handling system at ALB does not immediately follow the anaerobic fluidized bed reactor. Therefore, there are no data from ALB from which a BAT for solids removal could be established. In addition, to comply with a rule in terms of total COD, airports would need to control system flow rates to meet total COD limits, rather than controlling flow rates to hit a target influent soluble COD loading. Operating under these circumstances would require much larger systems that would need to be operated in a way that could jeopardize compliance with water quality-based limits. Currently, to manage the biosolids fraction of the effluent, airports either discharge the solids to publicly owned treatment works (POTWs) or remove biosolids in a separate system designed to meet water quality based solids requirements.

3. EPA Misinterpreted AFB Treatment Systems in Establishing the Proposed Effluent Limits Standard.

In establishing the proposed COD limits, EPA made several inaccurate simplifying assumptions with regards to AFB treatment systems in their development of effluent limits. Data are presented below indicating that EPA needs to perform a more in depth analysis of AFB performance data in assessing potential effluent limits. The following two assumptions are challenged:

- The assumption that there is no relationship between treatment influent characteristics and effluent concentrations.
- The assumption that the ALB data represents enough of a range of deicing, operating and compliance conditions to be representative of the model technology.

a. Influent Soluble COD Loading Rates Impact the Effluent Concentrations from an AFB Treatment System Under Certain Critical Circumstances.

On page 14-5 of the TDD for the Proposed Rule, EPA concludes that a well-operated and designed AFB treatment system should be capable of treating deicer runoff to a narrow range of effluent concentrations despite variation in influent COD concentrations. In drawing this conclusion, EPA determined that influent COD concentrations do not directly affect effluent concentrations for an AFB treatment system. However, this determination is only correct under a limited set of operational circumstances. EPA neglected to fully assess the relationship between influent loading rate (pounds of COD/day) and effluent COD concentration. This oversight resulted in the establishment of proposed effluent COD limit values that are lower than an appropriate analysis of the available AFB system data supports.

The relationship between influent COD load and effluent COD concentration is critical in the design and operation of AFB systems. In assessing this relationship, EPA must recognize that the COD load is the mass of materials contributing to COD that pass into treatment in a given time period (e.g., pounds of COD per day). COD load is calculated by multiplying COD concentration by the flow rate. If a constant COD load is desired when COD concentrations are variable, any increase in concentration must be offset by a proportional decrease in flow rate.

The AFB systems at ALB, CAK, PDX, and many industrial operations are designed to operate at a near constant influent COD load. Operation at a near constant influent COD load is desirable because it results in a more stable bacterial population, improving the treatment efficiency and increasing the predictability of system effluent. Increasing operational predictability decreases the risk of non-compliance.

Operating AFB systems to treat collected deicer runoff in an aviation setting, as opposed to treatment in other industrial settings, requires additional control measures to achieve near constant COD load because of the wide fluctuation in COD influent concentrations. The controls are designed so that influent COD concentrations are measured on an ongoing basis and the flow rates influent to treatment are adjusted to achieve the desired COD load. The variation in the influent collected COD concentrations is often too great to achieve constant COD simply with storage based equalization.⁶⁰

The COD load that an airport selects for operation is dependent upon several factors. One of the most important factors is the available storage capacity. When storage capacity is limited, an airport may choose to operate at a higher loading to achieve faster draw down of the volume in the storage structures in response to day to day weather and deicing conditions.

Review of the influent and effluent COD data from the ALB AFB treatment system on a season-by-season basis reveals that on an average seasonal basis, the influent COD loadings to the ALB reactors varied significantly over the nine seasons of influent data that is available (from 3,279 lbs COD per day to 8,865 lbs COD per day). ALB presumably operated with different loadings in different seasons as needed to meet their operational and compliance needs. It is likely that most AFB systems applied at airports would also have variable average seasonal influent loadings as the airports respond to variable deicing conditions.

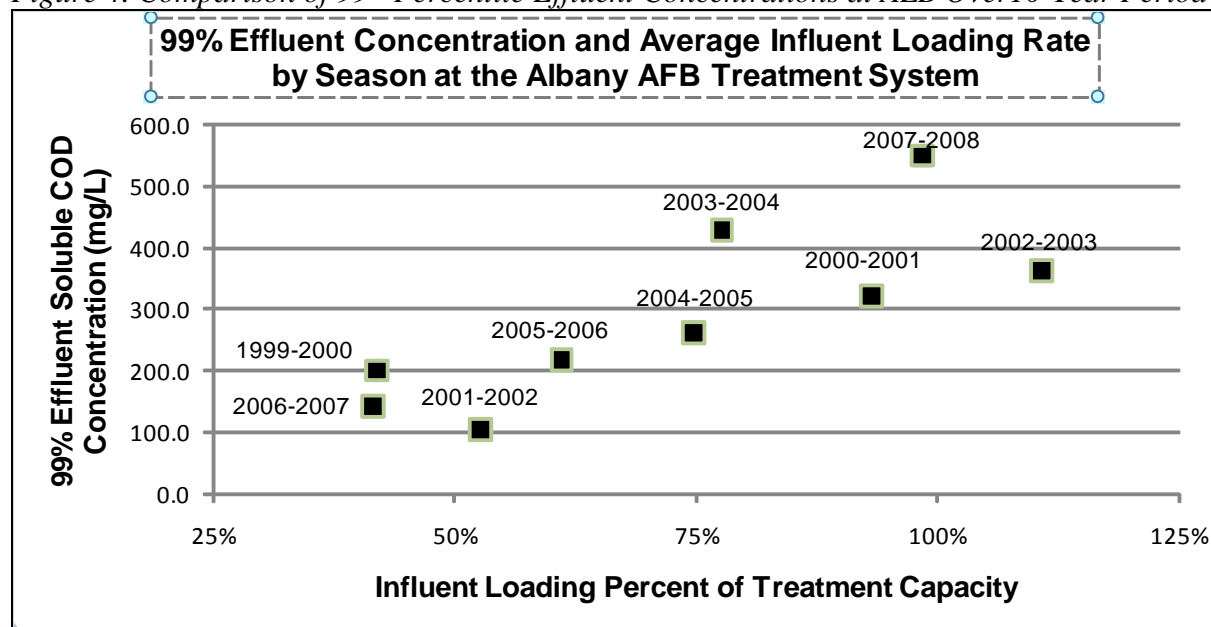
When the COD influent loading data at ALB is compared to the COD effluent concentrations at ALB, a relationship between COD loading and COD effluent concentrations emerges. In particular, when the average influent COD loading is well below the COD loading capacity of the AFB reactors, the average seasonal effluent concentrations are lower. When the average COD influent loading is close to the COD loading capacity of the reactors, the effluent concentrations are higher.

The results of the season-by-season data analysis at ALB are shown in the figure below. The graph plots the average seasonal influent COD at ALB in relationship to the average seasonal 99 percentile effluent COD concentration. The COD influent loading is shown as a percentage of the maximum reactor COD loading treatment capacity (as determined from the volumetric capacity of the reactors). For each season, the 99th percentile effluent concentration was

⁶⁰ Note that EPA's assumption that the CAK storage tanks perform a significant equalization function is generally incorrect because of the flow control required. While some equalization will occur in storage, the primary means of equalization is through flow rate management. Airports must monitor COD concentrations in the influent and modify pump or valve settings to adjust the flow rate. The frequency that they need to measure CODs and adjust flows is airport specific.

calculated using the same methodology and excluding the same periods described in EPA's analysis.

Figure 4. Comparison of 99th Percentile Effluent Concentrations at ALB Over 10-Year Period



The disparity in the effluent concentrations in relationship to the degree to which a reactor is loaded invalidates EPA's assumption that there is no relationship between influent conditions and effluent concentration. It also invalidates the data set used by EPA to calculate effluent limits.

An alternative means of calculating potential limits that factors in the effluent of influent COD load should be considered. The data provided in the above graphic provide a basis for a more appropriate means. The data suggest that use of performance data when the system was loaded well below its average capacity provide an unrealistic representation of the system performance. In particular, for the four seasons in which influent COD loading rates were less than 75 percent, the effluent concentrations were less than half the value of the effluent concentrations at ALB for the seasons when influent COD loading rates were near the system capacity. By utilizing the entire range of data and ignoring the relationship to influent COD loadings, EPA is, in effect, either forcing airports to operate at less than their loading capacity (thereby requiring more storage) and/or forcing airports to build larger treatment systems than were accounted for in their cost analysis.

If EPA used only the data in which influent loadings were within 25 percent of the load capacity, the 99th percentile concentration for daily limits would be 346mg/L, and the 97th percentile concentrations for weekly effluent limits would be 174 mg/L based only on the ALB data. The variability of the ALB system under "typical" airport and weather operating conditions must be accounted for in any final Airport Deicing ELG.

b. EPA Should Consider the Range of Influent COD Concentrations for Which the AFB Systems are Applicable

While AFB treatment systems can be engineered to treat a wide range of COD loads, there are technical and economic considerations that limit the range of COD treatment concentrations for which the AFB is suited. Analyses of the AFB capabilities indicate that the AFB technology should be limited to situations where the influent COD concentrations entering the treatment system can be maintained between 2,000 mg/L and 128,000 mg/L. This concentration range was derived from a series of analysis that relied, in part, on observations of AFB performance in airport deicing environments.

(1) Minimum Concentration Analysis

As discussed above, AFB treatment systems are designed to operate at a nearly constant COD loading rate, resulting in the need to adjust influent flow rates as influent COD concentrations change. As COD concentrations decrease, influent flow rates must be increased to maintain the COD loading. For most of the range of COD concentrations that airports might experience, this is not an issue as sufficient methane is generated by the bioreactor to heat the influent water to achieve the necessary temperature for treatment. As COD concentrations approach 2,000 mg/L COD or less, however, amount of methane produced by the system is not sufficient to heat the water. Natural gas or propane purchased by the airport must be used to supplement the methane supply from the reactor when COD concentrations go below 2,000 mg/L. The costs of natural gas or propane to supplement the methane supply in an AFB system was not included in EPA's description of the BAT and was also not included in the economic analysis.

The quantity and cost of purchased natural gas or propane when COD concentrations are less than 2,000 mg/L varies from site to site. In general, the costs for natural gas purchase are more significant for airports that have very large quantities of glycol use (which typically results in large quantities of water being impacted) or airports that have very large volumes of water to process because their deicer collection systems cover large areas.

(2) Maximum Concentration Analysis

In systems treating very high COD concentrations, the relationship between COD concentration, flow rate and constant COD load is also maintained in an AFB system. Similar to the low COD concentration case described above, the need to modify flow in response to COD concentrations at higher COD influent concentrations is not an issue for most of the COD concentration range to be treated at most airports. As influent soluble COD concentrations exceed approximately 128,000 mg/L, however, management of biosolids in the AFB treatment systems within the reactor /solids separator loop becomes a limiting factor. The rate of solids removal is dependent on the loading rate and is therefore nearly constant for an AFB treatment system. Normally, influent flow rates are much larger than the solids removal rate. If the influent flow rate decreases to less than the rate at which solids are removed from the system, more volume will be leaving the system than entering the system. This will cause the system to no longer operate in equilibrium and eventually make fluidization and treatment impossible.

(3) Summary of Issues for AFB Concentration Range

The range of influent soluble COD concentrations that can efficiently be treated by an AFB system is approximately 2,000 to 128,000 mg/L. For both the low concentration threshold and the high concentration threshold, the AFB system can manage brief excursions outside of the 2,000 to 128,000 mg/L COD range. However, treatment of high concentrations cannot be sustained for long periods.

This range has implications for identification of the technologies considered as BAT and EPA's cost analysis. EPA should consider this COD concentration range in assigning BAT and understand that systems that need to treat runoff outside of those ranges need different technologies. For example, for concentrations greater than 128,000 mg/L COD (approximately 8% propylene glycol) recycling technologies such as evaporation systems would be more appropriate. Those non-AFB technologies may have performance capabilities that differ from the AFB systems, including different capabilities for achieving effluent COD concentrations, which EPA should assess when proposing effluent limits. EPA also should consider the implications of this range of AFB capabilities on the cost analysis, especially for systems processing large quantities of deicer and systems that must collect runoff from very large areas. The cost per pound of COD and per gallon used by EPA from extrapolation of the ALB and CAK data is not appropriate for systems needing to treat COD concentrations outside of the AFB range.

c. EPA's Assumption That the ALB Data Was Representative of the Range of Potential Site Conditions Is Flawed and Affects the Effluent Limit Calculation.

The analysis presented above showing the relationship of influent loading to effluent concentration was performed only on ALB data. Since EPA performed its analysis, the first full season of operational data from the Akron-Canton Airport (CAK) AFB system (2008-2009) has become available. The CAK deicer management system differs from the ALB system in that deicing collection is performed on deicing pads and in that the storage volume for collected deicer is considerably less. It also differs in that the NPDES effluent limits are in terms of propylene glycol concentration, rather than COD. Those differences in operations and permit compliance requirements led to a different set of design conditions for the CAK systems. In operation, operational decisions regarding influent loading rates and flow rates were made to meet the compliance requirements for that facility. By being able to operate according to their design intent and having the operational flexibility to adjust to changing influent conditions, both the ALB and CAK systems have been able to achieve COD removal rates of greater than 99.5 percent and meet their compliance requirements.

In an attempt to analyze the effect of those differing design, operational, and compliance conditions on effluent limits, the average influent COD loadings and average COD effluent limits from CAK were incorporated into the loading-effluent concentration analysis performed on the ALB data as described above. Based on EPA's analysis that each reactor is considered a separate facility, incorporation of the CAK data into the effluent limit analysis simply adds additional facilities to the data set.

The table below shows the values for the 99th percentile effluent soluble COD concentration from each of the ALB reactors considering only the five seasons that fell within 25 percent of the reactors maximum COD loading rate capacity as well as the 99th percentile effluent soluble COD concentration from each of the two reactors at the CAK system from the 2008-2009 deicing season. The 99th percentile values shown below were calculated using the methodology described in the TDD.

Table 7. 99th Percentile Soluble COD Effluent Concentrations from Each Treatment Reactor

Treatment Unit	Number of Daily Values	99 th Percentile Soluble COD Effluent Concentrations (mg/L)
ALB R-101	651	453
ALB R-102	634	238
CAK R-601	229	640
CAK R-602	229	432
Median Value		443

When the results from all reactors are assessed using the EPA methodology, the results indicate a 99th percentile effluent concentration of 443 mg/L soluble COD, which is substantially higher and more appropriate than EPA's proposed limit of 271 mg/L (soluble) COD.

The same set of data used to recalculate the 99th percentile daily effluent concentrations was used to recalculate the 97th percentile weekly effluent soluble COD concentrations from each of the four reactors for which data exists. The table below shows the 97th percentile effluent concentrations utilizing only seasons operated within 25 percent of the reactors capacity and calculated using the same methodology described in the TDD.

Table 8. 97th Percentile Soluble COD Effluent Weekly Average Concentrations from Each Treatment Unit

Treatment Unit	Number of Weekly Averages	97 th Percentile Soluble COD Effluent Concentrations (mg/L)
ALB R-101	111	191
ALB R-102	107	156
CAK R-601	33	422
CAK R-602	33	417
Median Value		304

The results show a 97th percentile soluble COD concentration of 304 mg/L soluble COD, which is significantly higher and more appropriate than the 154 mg/L soluble COD presented in the proposed rule.

These results suggest that site specific considerations and operational decisions have an impact on the calculated effluent limits in the proposed rule. Failure to conduct a more thorough analysis of model BAT treatment for this particular ELG and this uniquely complex industry will yield results that cannot be impemented by the industry or defended by EPA.

F. EPA Has Overestimated Benefits Associated with BAT Standards

EPA estimates that the Proposed Rule will result in a reduced COD discharge of 27.2 million pounds associated with ADF and 12.7 million pounds associated with pavement deicer. The Agency estimates additional ammonia reduction benefits of 4.7 million pounds. These estimates are significantly overstated because: (1) EPA overestimates current ADF usage; (2) EPA incorrectly assumes that all pavement deicer and all ADF that is not collected is in fact discharged to surface waters; and (3) EPA has taken credit for benefits from reduced pollutant discharges that will occur regardless of this rulemaking. The load reductions expected from any future ELG will comprise a percent reduction of the existing baseline pollutant loads. By overestimating existing baseline pollutant loads, EPA in essence “generates” load reductions that will not be realized through implementation of this Proposed Rule.

1. EPA Has Overestimated ADF Usage.

EPA’s estimates of ADF used at airports across the U.S. are based on a statistical survey of airlines in which EPA obtained the amount of ADF purchased by airlines at various airports. EPA developed a methodology to extrapolate the airline data to determine total ADF used at individual airports, which was then scaled up for a national estimate. ACI-NA is prohibited from identifying specific errors in EPA’s methodology or statistical calculations.⁶¹ Nevertheless, ACI-NA has access to reliable industry ADF usage data, which we assert is more accurate and reveals the extent of EPA’s overestimation. EPA’s error results in miscalculations regarding: overestimating pollutant loads; overestimating pollutant load reductions achievable by the regulation; and overestimating the environmental benefits associated with the proposed standards.

The Transportation Research Board’s Airport Cooperative Research Program (ACRP) initiated a project in 2007 to calculate quantities of ADF and airfield deicing materials used at major airports across the country.⁶² The ACRP project team collected ADF usage data from 72 airports for the 2002-2005 deicing seasons – the same years of data EPA relied on in developing the Proposed Rule. The project research team also developed statistical estimates for another 112 airports. ACRP concluded that, on average, 15,200,000 gallons of ADF were used nationally during each year during the 2002-2005 deicing seasons. EPA’s national estimate of 25,000,000 gallons per year is over 10,000,000 gallons higher than the ACRP’s data. Appendix C contains a chart comparing EPA estimates of ADF usage at airports subject to the Proposed Rule compared with data available through the ACRP project.

As a result of EPA’s overestimation, there are several significant impacts on EPA’s proposed rule apart from national pollutant loadings and benefits. Using ACRP data, the proposed 60 percent ADF collection standard would apply to less than the 14 EPA predicts. For instance, EPA estimates annual ADF usage at Washington Dulles International Airport (IAD) to be 1,076,083 gallons. Through the ACRP data, which was confirmed with IAD, actual usage is

⁶¹ Because the airline respondents indicated ADF purchase data is confidential business information, EPA was not able to provide this data in the rulemaking’s public record. EPA was also not able to provide the methodology used to develop the airport and national ADF usage estimates because of the ability to back extrapolate and determine confidential ADF purchase data.

⁶² ACRP 11-02 (Task 10) — Estimate of National Use of Aircraft- and Airfield-Deicing Materials (2008).

276,652 gallons – a difference of 289 percent. In estimating the load reduction expected for this airport due to the regulation, EPA determined that IAD currently collects 40 percent of applied ADF, meaning the airport would have to collect an additional 20 percent in order to meet a 60 percent standard. EPA estimated the additional collection requirements would equate to a reduction of 1,966,949 pounds in COD discharges. In fact, as proposed, the Rule would result in no environmental benefit from IAD because it would only be subject to 20 percent collection standard, which it currently exceeds. Cleveland-Hopkins International Airport is in the same situation, with an actual estimated average ADF usage over the deicing seasons of 2002-2005 of 414,247 gallons, dropping it from the 60 to 20 percent collection standard, and eliminating 1,236,370 pounds of predicted COD benefit.⁶³ These two airports alone account for eight percent of the COD discharge reduction expected from the Proposed Rule.

EPA could argue that there are other airports for which they underestimate ADF usage. In doing so, it is gambling that by being wrong consistently, the Agency may luck out and reach a correct conclusion. Such an argument would be unacceptable to the airport industry. Either EPA should correctly analyze its proposed rulemaking and ensure that its calculations hold up to public scrutiny or it should redo much of its Proposed Rule. If we assume that EPA's ADF estimates are incorrect, then its options analysis also is incorrect, as well as many of its calculations that led it to using the 460,000 gallon threshold criterion and regulatory conclusions.

ADF usage data from 2002-2005 may also not be reflective of more current usage, particularly because overall operations have declined as a result of the economic downturn. For example, Pittsburgh International Airport used an average of 593,629 gallons of ADF during the deicing seasons 2002-2005. The airport also had an average of 333,099 annual operations during calendar years 2003-2005. In comparison, the airport used an average of 309,541 gallons of ADF during deicing seasons 2007-2009, calendar years during which annual operations averaged 176,287.

Additionally, most of the reductions in estimated ADF usage that would result from EPA using more accurate (ACRP) data would cause load reductions to be reduced proportionally more than they would cause costs to be reduced. This is because load reductions achieved by the proposed regulation are generally proportional to expected baseline ADF usage, but costs associated with the Proposed Rule will decline less proportionally based on reduced estimated ADF usage. Much of the compliance cost associated with EPA's proposed standard is determined for an airport by the factual determination regarding whether it is over the proposed departures threshold. Hence, the cost for any given airport will decline very little, or at least much less proportionally than the reductions in ADF usage resulting from EPA going back and correcting its data. The bottom line is that the Proposed Rule is built on a very shaky factual basis and a significant change in ADF usage estimates could completely alter EPA's regulatory conclusions.

Because fluid base type (EG vs. PG, not Type I vs. Type IV) impacts estimated COD removal – because EG and PG have different COD “weights” – EPA's mischaracterization with regard to fluid base type is significant. In fact, EPA's model mischaracterizes the base types of fluids used at many airports. For example, EPA data incorrectly indicates that 41,726 gallons of ethylene glycol is used annually at Denver International Airport (DEN). In fact, no ethylene glycol is

⁶³ *Id.*

used at DEN. In Appendix X, ACI-NA has provided the ACRP findings regarding quantities and types of ADF used at major airports across the country. We encourage EPA to substitute that data for its own estimates, or to initiate an alternative data collection exercise to base any future deicing ELG on appropriate, accurate, and current data.

2. EPA Incorrectly Identifies Various Airports' ADF Collection Efficiencies.

EPA's benefits analysis requires three main components: the amount of ADF used; the existing collection efficiency; and the additional collection associated with the proposed standard. In the previous section, ACI-NA demonstrates that EPA has miscalculated the amount of ADF used. However, EPA also has incorrectly calculated the current collection efficiencies at a number of airports. Once again, for some airports EPA has overestimated collection efficiency, while at many others it has underestimated collection efficiency. The key issue is that EPA's significant inaccuracies reduce overall confidence in its analyses and support reconsideration of the proposed rule or a "reproposal."

Several examples will illustrate this point. EPA reported that Portland International Airport (PDX) collects 20 percent of applied ADF. In fact, through significant infrastructure investment, PDX actually collects 40 percent. EPA also assumed Salt Lake City International Airport (SLC) collects 60 percent of applied ADF simply because the airport utilizes deicing pads. SLC staff, however, report that their current deicing pad system achieves a 20 percent collection rate. Such inaccuracies further contribute to an inaccurate estimate of the current loads and the load reductions that EPA can rightfully attribute to the Proposed Rule.

3. The Proposed Rule Focuses on Reducing COD Discharges from Marine Airports, Which Will Provide Little Environmental Benefit.

According to EPA's estimates, the proposed ADF collection and treatment requirements will result in a reduction of 27.2 million pounds of COD discharges. Over 18 million of the 27.2 million pounds of COD removal are associated with four airports: Boston's General Edward Lawrence Logan International Airport, Newark Liberty International Airport, and New York's John F. Kennedy International and LaGuardia Airports. This equates to 66 percent of the total ADF-related COD removals expected to result from implementation of the Proposed Rule. These airports discharge directly into the Atlantic Ocean. Years of study at these airports indicate that deicer stormwater discharges have never lead to any concern about water quality violations for dissolved oxygen.⁶⁴

The environmental impacts of glycol-based ADF are significantly less with regard to saltwater receiving waters than they are to freshwater. By simple comparison, the "toxic weighting factor" (TWF) for EG in freshwater is 0.00134, in the copper-based toxicity scale (where copper toxicity = 1.0). EG's saltwater TWF is a miniscule 0.00000812. PG's TWFs reflect the fact that PG is far less toxic than EG. The freshwater TWF for PG is 0.0000572 and the saltwater TWF is 0.000000855. Clearly, EPA cannot take credit for much benefit derived from removing PG or EG discharges from ocean environments.

⁶⁴ See, for example, comments on the Proposed Rule submitted by the Port Authority of New York and New Jersey.

4. EPA Mistakenly Assumes All Pavement Deicer and All Applied ADF that Is Not Collected Will Be Discharged.

In calculating the baseline pollutant loads and load reductions attributable to the Proposed Rule, EPA assumed that 100 percent of all available ADF that is not collected will reach outfalls. Similarly EPA assumes 100 percent of pavement deicer reaches outfalls. These assumptions do not account for the loading reduction that naturally occurs through evaporation and degradation in ponds, drainage systems, grass, etc.

5. Deicing Product Advances are Expected to Achieve Environmental Benefits Not Accounted for by the Proposed Rule.

Airports and airlines have continuously worked with manufacturers of deicing products to ensure a sustained advancement in the reduction of the environmental impacts of those products. As proposed, the rule neither accounts for nor encourages such advances. As the environmental performance of these products continues to improve, the associated benefits will not be accounted for under the proposed structure of the rule.

6. EPA Does Not Account for Benefits That Would Otherwise Occur Through the TMDL Program.

Airports discharging to impaired waters are, or soon will be, subject to stringent pollutant discharge limits through the total maximum daily load (TMDL) program. Such water quality limits are more stringent than any limits that would be imposed by the Proposed Rule. According to the ACRP report, about 88 percent of the national total average annual ADF use is subject to regulation under either the TMDL program or an individual NPDES permit or both.⁶⁵ Sixty-one (61) airports are subject to the TMDL program (accounting for 45 percent of total annual ADF usage). EPA has not acknowledged the benefits that will already be derived through the TMDL program.

7. EPA Should Develop a Full Environmental Assessment and an Analysis of Monetized Benefits for the ELG

It is very unusual for EPA not to have done an environmental assessment and a monetized benefits analysis for an ELG, as is the case here for the proposed Airport Deicing ELG. EPA staff indicated to us that this unusual course was taken because the proposed regulation is projected to cost less than \$100 million per year and there is no requirement for EPA to develop such analyses for a regulation that is projected to cost less than this figure. This is true, but EPA has nevertheless always (insofar as we are aware) developed an environmental assessment and a monetized benefits analysis for ELGs, including for those ELGs that have been estimated to cost much less than \$100 million/year.⁶⁶ It is not at all clear to us why EPA has chosen for the

⁶⁵ ACRP 11-02 (Task 10) — Estimate of National Use of Aircraft- and Airfield-Deicing Materials (2008).

⁶⁶ For example, consider those ELGs promulgated since the beginning of the year 2000. EPA's effluent guidelines internet page (<http://www.epa.gov/waterscience/guide/industry.html>) shows six ELGs first promulgated since the beginning of the year 2000: Centralized Waste Treatment, Concentrated Aquatic Animal Production, Landfills, Metal Products and Machinery, Transportation Equipment Cleaning, and Waste Combustors. Each of these six promulgated ELGs involved annualized costs of much less than \$100 million per year and much less than

proposed Airport Deicing ELG not to develop an environmental assessment and monetized benefits analysis in contravention of EPA's consistent policy to develop such analyses for all ELGs, even when they are projected to cost less than \$100 million per year.

In our view, there are two reasons in addition to precedent why EPA should develop these analyses for the proposed Airport Deicing ELG:

First, the interested public and the potentially regulated community needs to know what the water quality impacts and the monetized benefits are estimated to be from this proposed regulation. The public needs to know what the regulation is likely to do in terms of improving water quality and whether the regulation is likely to provide benefits commensurate with its costs. We certainly understand that ELGs are legally required to reflect technological capability rather than water quality impacts, but it is nevertheless a principle of good administrative decision-making that a regulatory agency must analyze and consider the impacts and benefits of all proposed regulations, and make the Agency's estimates regarding these issues available to the public to enable informed comment on proposed regulations.

In fact, we believe that the proposed Airport Deicing ELG would provide only modest water quality benefits, and that the monetized value of the rule's benefits would fall very far short of the rule's costs. We believe that an environmental assessment and a benefits analysis would make these points clear, and that this information would likely affect both the Agency's decision-making about this regulation and the public's comments on it. We believe the proposed regulation will provide very limited environmental benefits for several reasons:

- There are minimal quantities of priority (toxic) pollutants at issue in airport deicing effluents and limited quantities of nutrients. EPA's concern really only focuses on oxygen demand;
- Many airport discharges are to waters offering very high dilution and little concern about oxygen-demanding pollutant loads;
- Deicing discharges occur largely during winter months, when dilution is particularly high and very limited beneficial uses are being made of receiving waters (i.e., no swimming, little fishing and boating);
- Deicing discharges are already being managed and will be managed as necessary to meet receiving water quality needs, pursuant to stormwater permits and existing and planned TMDLs. A recent ACRP study estimates that 88% of all aircraft deicer usage now occurs at airports at which the applicable NPDES

the costs estimated for the proposed Airport Deicing ELG, and yet EPA prepared environmental assessments and monetized benefits analyses for each of these six much less costly ELGs. In addition, since the year 2000 we believe that EPA has promulgated two additional ELGs that do not show up on EPA's web page as first promulgated since the beginning of 2000: revisions to the CAFO ELG and Construction and Development. Both of these recent ELGs cost more than \$100 million per year, and for both of them EPA prepared an environmental assessment and monetized benefits analysis. In sum, as best we are aware, since the beginning of the year 2000, EPA has promulgated eight ELGs, and each has been accompanied by an environmental assessment and a monetized benefits analysis. Six of these eight promulgated ELGs were estimated to entail costs of much less than \$100 million annually, and much less than what the proposed Airport Deicing ELG is projected to cost.

permits already prohibit any discharge that causes or contributes to a violation of ambient water quality standards;⁶⁷

- Note all the various ways that we have discussed where in the current analysis EPA overestimates the load reductions likely to be achieved by the ELG (e.g., current deicer usage is greatly overestimated, inaccurate assumption that all pavement deicer used reaches surface waters, inaccurate assumption to the effect that all ADF available for collection that is not collected will reach surface waters, etc.) EPA must estimate loads and load reductions in a more accurate manner when doing the eventual environmental assessment and benefits analysis.

Our second reason for believing that EPA should prepare an environmental assessment and monetized benefits analysis for the proposed Airport Deicing ELG is because an accurate estimate of likely compliance costs posed by the proposed ELG would show costs far in excess of \$100 million per year. Executive Order 12866 requires a full monetized benefits analysis and explicit comparison of costs against benefits for any proposed regulation with costs exceeding \$100 million per year (as well as any other regulation posing significant policy concerns). EPA thus far in its analysis has greatly underestimated the compliance costs likely associated with the Proposed Rule, and even so has arrived at a cost estimate of \$ 91.3 million per year, only slightly below the \$100 million per year mandatory threshold for benefits analysis. Correcting the numerous errors in EPA's current cost analysis (e.g., omitting costs of operational impacts; underestimating costs for pads, GRVs, treatment and piping; omitting costs for new sources, etc.) would result in estimated costs far greater than \$100 million per year.

G. EPA Has Significantly Underestimated the Costs Associated with Its Proposed Rule.

EPA has grossly underestimated the costs associated with implementation of the Proposed Rule. EPA's failure to properly account for the overall cost of the proposed rule relates to all aspects contained in EPA's proposal. These include obvious oversights in terms of simply not including obvious costs related to the proposed technologies or not understanding airport financing. They also include equally important, but less obvious to people not engaged with the industry, consideration regarding impacts on service capabilities of particular airports or to the national air service as a whole. EPA also miscalculated, misused methodologies, or used the wrong methodology to calculate potential impacts. Finally, EPA merely underestimated or wistfully believed that airports have greater control over costs than is reasonable. In any event, EPA must revisit its cost analyses consistent with the comments below.

1. EPA Must Analyze and Account for Operational Cost Impacts.

EPA has completely missed or conveniently ignored the potentially significant costs of the operational impacts created by the proposed collection requirements. As previously discussed, the use of both GRVs and deicing pads can considerably impact aircraft operations. Operational impacts such as delayed arrivals and departures, increased taxiing time, and reduced capacity will result in financial impacts to airports, airlines, passengers, and beyond. In addition, costs

⁶⁷ ACRP 11-02 (Task 10) — Estimate of National Use of Aircraft- and Airfield-Deicing Materials (2008).

may also be incurred through the operational disruptions that occur during the construction of deicing pads. The impacts to operations and the associated costs can, and should, be calculated and factored into EPA's cost-benefits analysis.

Changes to deicing procedures and infrastructure may adversely affect flight operations at an airport, with resulting costs to airports, airlines and the flying public. Switching from gate/apron deicing to deicing pads can result in queuing at pads, operational constraints (e.g., taxiway/runway use restrictions), and/or increased travel distance and taxiing time for aircraft from gates to runways. Switching defrosting operations from the locations where defrosting is currently conducted (typically at gates, but also at hangars, hangar ramps, etc.) to deicing pads will require taxiing planes from parking locations to pads and back to gates. Taking pavement areas at an airport out of service while drainage and collection improvements are constructed can result in various inefficiencies during the construction period. Ineffective and/or slower pavement deicing (such as might ensue in some instances if urea were banned) reduces airport capacity, resulting potentially in flight diversions and delays. Even the use of GRVs adds to existing airport traffic, potentially slowing already-complex operations (particularly when deicing occurs in gate areas, where GRVs would need to be added to planes, fuel service, baggage handling, catering, maintenance, ground control, security, passengers, deicing equipment, etc.). Further, airports and airlines do not operate in isolation, but within the National Airspace System, of which the overall efficiency can be affected as delays propagate across the entire system. This is particularly true of delays in the New York and East Coast airports.

The cost of these operational impacts resulting from the ELG, including delays and the additional time spent in preparing aircraft to fly in winter weather, should be estimated for airports, airlines and passengers. The FAA suggests methods for identifying delays and estimating and monetizing them in "FAA Airport Benefit-Cost Analysis Guidance."⁶⁸ FAA has also suggested specific unit values for these delays in the form of cost per aircraft hour and cost per passenger hour in "Economic Values for Evaluation of Federal Aviation Administration Investment and Regulatory Programs."⁶⁹ The Air Transport Association has updated these unit values, resulting in the following estimates applicable for 2008:⁷⁰

- Cost of aircraft delays: \$74.10 per block minute (covering all aircraft costs including fuel, crew, maintenance, aircraft ownership, etc., estimated across all forms of delay including both airborne and on-ground). Costs in terms of aircraft variable costs only (i.e., excluding ownership costs for the aircraft) can be derived by applying the FAA's estimated ratio of variable to total costs (0.791) to the total cost per minute. The resulting estimate for variable aircraft costs is \$58.65 per minute of delay.
- Cost of passenger delays: \$35.70 per passenger hour.

⁶⁸ Office of Aviation Policy and Plans, December 15, 1999, at http://www.faa.gov/airports_airtraffic/airports/aip/bc_analysis/media/faabca.pdf.

⁶⁹ Office of Aviation Policy and Plans, June, 1998, at <http://ntl.bts.gov/lib/20000/20800/20898/PB98157530.pdf>.

⁷⁰ See <http://www.airlines.org/economics/cost+of+delays/>

EPA must estimate the operational costs associated with changed deicing procedures as will be necessary for compliance with the proposed ELGs. Some costs will be incurred by airports, some by airlines, and some by passengers (e.g., associated with increased delays). These various operational costs should be included in the various models used to estimate the economic impacts of the Proposed Rule. We believe that the operational costs associated with EPA's proposal are large and very substantial relative to the direct compliance costs that EPA has estimated thus far. In an example below, we estimate the operational costs associated with the change from gate/apron deicing to deicing at pads as will be necessary at the seven large, northern tier airports that EPA projects will need to install deicing pads in order to comply with the proposed 60% collection requirement for ADF (BOS, CLE, EWR, IAD, JFK, LGA, ORD).

a. Operational Costs to Switch to Pad Deicing for Seven Airports that EPA Estimates Will Be Subject to 60 Percent Collection Requirements Are Significant.

EPA estimates that deicing a flight at a dedicated deicing pad will add an average of 1 hour to the time required for flight departure relative to traditional deicing at the gate/apron: 15 minutes in additional taxiing time for the aircraft (loaded with crew and passengers and ready to depart) to proceed from gate to deicing pad, 30 minutes for deicing at the pad, and 15 more minutes in additional taxi time for the plane to proceed from pad to runway.⁷¹ We estimate, to parallel EPA's estimate for deicing, that *defrosting* a plane at a dedicated deicing pad will add an average of 45 minutes to the time required for flight readiness relative to commonly practiced defrosting at the location where the plane is parked overnight:⁷² 15 minutes in additional taxiing time to proceed from overnight parking (at a gate, hangar, apron or elsewhere on the airfield) to deicing pad, 15 minutes for defrosting at the pad, and 15 more minutes in additional taxi time for the aircraft to proceed from pad to gate where it will be loaded for the first flight of the day or to the runway if it was loaded first. In our calculation of operational costs associated with the proposed 60% collection requirement for the 7 airports that EPA estimates will need to install centralized pads, we apply these estimates of additional deicing/defrosting times to the estimated annual average number of deiced/defrosted flights at these airports, and then estimate resulting monetary costs by applying the FAA/ATA unit cost factors.

EPA has developed estimates for the annual volume of ADF used at each of these seven airports that the Agency projects will need to install and use centralized pads for all deicing/defrosting, (TDD, pages 10-9 and 10-10). We then apply further information developed by the Minneapolis

⁷¹ TDD at 12-4 through 12-8.

⁷² EPA's proposed performance standards for deicing pads specify that "All aircraft deicing shall take place on a decentralized deicing pad, with the exception of deicing for safe taxiing". Proposed 40 CFR 449.20(b)(1)(ii)(A). Defrosting is a form of deicing, and it is needed for safe flying, and not for only safe taxiing. We thus believe that the proposed regulation will require airports subject to the 60% collection requirement to conduct both defrosting and traditional deicing at centralized pads.

Note one major difference in the operational impact of this requirement relative to defrosting vs. deicing. Defrosting is most commonly conducted after overnight storage of the plane and before passengers are loaded for the aircraft's first flight of the day. Additional time requirements that the ELG imposes on defrosting thus add more operating costs for the plane (e.g., fuel, some crew), but not for passengers. Most deicing, in contrast, is conducted with the plane full of passengers, and additional time requirements thus affect both aircraft operating costs and passenger delays.

- St. Paul International Airport (MSP), another large, northern tier airport assumed by EPA to meet BAT, in order to estimate from EPA's fluid usage figures the number of aircraft deiced and defrosted during an average winter season at each of these seven airports. Based on data from MSP,⁷³ we assume at these seven airports that 74% of total ADF usage is for deicing and 26% is for defrosting. We further assume based on data from MSP that the average quantity of glycol used to deice an aircraft is 102 gallons and the average quantity used to defrost an aircraft is 38 gallons. With this information and EPA's fluid usage estimates, we can then estimate the number of aircraft deiced and defrosted during an average winter season at the seven airports. Applying the delay factors estimated by EPA in the TDD for deicing a typical flight at a centralized pad instead of at the gate/apron, and the FAA/ATA unit cost factors for these delays, we then estimate the total operational costs of switching deicing and defrosting from gates/aprons to centralized pads at the 7 airports. The result is an estimate of **\$442 million per year in operational costs per year at these seven airports resulting from the ELG requirement for 60% collection**. A spreadsheet documenting these calculations is contained in Appendix E.⁷⁴

Table 9. Operational Costs to Switch to Pad Deicing at Seven Airports Identified by EPA as Needing to Do So

Code	Airport Name	Additional Operational Costs/yr Due to ELG			
		Defrosting - planes*	Deicing - planes	Deicing - passengers	Total
ORD	Chicago, IL: O'Hare	\$23,297,542	\$38,618,753	\$43,836,410	\$105,752,705
JFK	New York, NY: Kennedy International	\$8,602,869	\$14,260,391	\$16,187,067	\$39,050,328
EWR	Newark, NJ: Newark Liberty International	\$17,251,762	\$28,597,074	\$32,460,734	\$78,309,571
LGA	New York, NY: La Guardia	\$7,452,708	\$12,353,847	\$14,022,936	\$33,829,492
BOS	Boston, MA: Logan International	\$15,288,441	\$25,342,610	\$28,766,570	\$69,397,621
IAD	Washington, DC: Dulles International	\$16,530,171	\$27,400,941	\$31,102,994	\$75,034,106
CLE	Cleveland, OH: Hopkins International	\$8,945,279	\$14,827,982	\$16,831,343	\$40,604,605
Total					\$441,978,427

These estimated operational costs of \$442 million/year associated with deicing at centralized pads at only 7 airports are very large relative to the total costs of \$91 million/year that EPA has estimated for the entire proposed rule (but ignoring operational costs). It is clear that EPA must assess operational costs in order to come anywhere near estimating the total costs of the proposed ELG.

EPA makes an incorrect statement in the Economic Analysis in explaining why the Agency chose (wrongly) to believe that operational cost impacts, such as those we have estimated in switching from gate/apron deicing to pads, do not exist. EPA states:

“Furthermore, EPA believes that as long as deicing pads do not reduce the number of departures per hour below the limit caused by the weather itself, then the cost of delays is attributable to the bad weather, not the deicing pads. ...

⁷³ Deicing program data for MSP for the 2006/2007, 2007/2008, and 2008/2009 seasons, cited elsewhere in these comments.

⁷⁴ This cost estimate is not very sensitive to the estimate applied from MSP to the effect that 26% of total deicer usage is for defrosting and 74% for deicing. If we were to assume that 0% of total deicer usage at these 7 airports is for defrosting, the cost estimate would be \$466 million/yr. Assuming at the other extreme that 100% of deicer usage is for defrosting would result in a cost estimate of \$381 million/yr. See the referenced spreadsheet in Appendix E.

Therefore, EPA did not estimate costs for potential delays that might be caused by deicing pads.”⁷⁵

EPA is simply incorrect in this statement. We agree that bad weather can cause delays, but the increase in delays during bad weather resulting from deicing at pads rather than at gates/aprons is the quantity that should be assessed and counted as a cost of the regulation. This increase in delays can be substantial, even if the pads are sized so as to accommodate an aircraft throughput equal to: a) “the airport’s peak hourly departure rate” (as EPA has proposed⁷⁶); or b) “the airport’s peak hour departure rate that the [air traffic control tower] can manage during icing conditions” (as FAA guidance requires; see discussion elsewhere in these comments). The amount of weather-related delay associated with pad deicing depends on two factors: 1) the throughput of the deicing pads; and 2) the total length of time required to get an aircraft from push-back at a gate to and through the pad and then to the runway for takeoff. EPA recognizes the first of these factors, but fails to appreciate the importance of the second. To the extent that pad deicing requires a plane to spend more time proceeding from gate to takeoff (e.g., because of taxi time to the pad, time spent during deicing on the pad with passengers on board, and taxi time from the pad to runway) than does gate deicing, a shift to pad deicing will increase delays during weather conditions when deicing is required.

2. EPA Must Consider the Potential Loss of Airline Service

Airports across the country continue to face operational and financial challenges, including reductions in air service, increased air fares, high cancellation and delay rates, and compliance costs associated with on-going, new and proposed regulatory initiatives. With the seemingly increased rate at which more regulatory and financial burdens are being placed upon airports and airlines, including this Proposed Rule, ACI-NA remains concerned about the cumulative effect of the resulting compliance costs on the availability, and sustainability, air service, particularly at small and non-hub airports. As airports are forced to increase fees to airlines in order to pay for many of these additional costs, it impacts an airline’s decision to provide service to that airport, or that region. This may be particularly true for routes that are only marginally profitable, currently operating at a loss, or currently operating through subsidies.

Maintaining adequate access to the national aviation transportation network is of vital economic interest, especially to small and rural communities. However, EPA’s proposed rule has the potential to reduce or eliminate service to some of those communities. EPA must add as a direct cost of its proposed rule the cost associated with any loss in service that will result from any future deicing ELG. EPA did not address this issue in the proposal.

3. EPA’s Costs Must Fit “Real World” Conditions.

EPA has made many assumptions that may seem reasonable for the types of past industries it has regulated through the ELG program, but that do not make sense for the aviation industry. For example, EPA assumed that Southern California airports can contract for GRV service to comply with any ADF collection standard. However, in the real world, there are zero GRV contracting

⁷⁵ EA at 4-3.

⁷⁶ 74 Fed. Reg. at 44718.

services in Southern California, and even if there was one, every airport would need the same service based on the same weather condition, making such an approach ridiculous. Hence, EPA's estimates of \$1,100 - \$6,700 per season for GRV collection at small southern tier airports contradict real world situations. Instead, EPA must assume that such airports would have to incur the costs associated meeting BAT for 20 percent collection and treatment – capital and annual costs for GRVs and an AFBR. The actual costs to be incurred by infrequent ADF users are significantly higher than EPA estimates. EPA could fix this issue by modifying its scope considerations, including exempting any airport that uses less than the MSGP benchmark cutoff of 100,000 gallons of ADF.

4. EPA Must Account for the Significant Costs for Land Constrained Airports.

As detailed elsewhere in these comments and in the comments of entities operating land constrained airports, meeting the proposed collection requirements without undergoing significant costs (and operation changes) will be challenging, if not impossible. Land constrained airports have limited (if any) options available for locating deicing pads, necessary storage and conveyance, and treatment systems. With the additional constraints imposed by critical safety and operational requirements, an airport may be forced to consider options such as acquiring, relocating and/or demolishing existing infrastructure, some of which may currently provide airport revenue. Even potential locations for siting deicing pads may not be large enough to accommodate the airports deicing needs or they may be located in areas that are not operationally ideal (e.g., require taxiing across active runways or at the opposite of the runway departure end). At airports constrained by surrounding water, the only option for meeting safety and operation needs could require filling in waterways. Such an endeavor is not without significant (and general prohibitive) environmental, financial, and political impacts. EPA has made no effort to account for the unique, and substantial, costs these land constrained airports will face in attempting to meet the requirements of the Proposed Rule.

5. Collection, Treatment, Storage, and Pavement Deicing Costs Are Underestimated.

a. EPA's Basis for Determining GRV Costs Is Inappropriate.

To estimate GRV capital and annual costs for airports subject to the proposed 20 percent collection requirements, EPA relied on cost data reported by six airports. There are a number of inherent problems with EPA's analysis. First, the data relied upon to determine GRV costs are inconsistent. EPA mistakenly assumed the cost data provided by each airport were reflective of one GRV. However, the capital costs provided by Buffalo reflected two, not one, GRVs.

Second, EPA assumed the number of GRVs required was a function of the number of deicing stormwater outfalls. As previously discussed, this assumption has no basis. No connection has been shown between the number of outfalls, the appropriate number of GRVs, and an airport's ability to meet the proposed 20 percent collection requirements. Therefore, the number of outfalls does not provide an appropriate basis for determining GRV costs. EPA must develop a more sophisticated cost model and analyses to properly quantify GRV costs.

Third, the capital and annual cost data relied on for developing normalized average costs were not all reflective of the costs associated with BAT. Because EPA has not identified any airports currently meeting BAT for 20 percent collection through GRVs, EPA has no real world basis for determining the costs associated with meeting that BAT standard. The airports relied on for determining GRV costs also rely on other collection technology in addition to GRVs. Simply looking at those airports' GRV costs will not provide an accurate estimate of the costs associated with meeting BAT.

The annual GRV O&M costs are also not reflective of the actual costs to be incurred by airports required to meet 20 percent collection requirements. EPA has not assessed whether the airports relied upon to determine annual costs actually meet the collection requirements. In order to determine the O&M costs that may be incurred by an airport required to collect 20 percent of available ADF, EPA must analyze the costs incurred by airports that currently meet the proposed requirements. EPA cannot simply rely on the GRV O&M costs from a few various airports without establishing how indicative they are of costs to be realized under the Proposed Rule.

b. Deicing Pad Costs Are Grossly Underestimated.

As proposed, the rule will require a limited number of airports to collect 60 percent of available ADF. To assess the costs to be incurred by those airports, EPA developed average normalized installation and annual cost estimates for centralized deicing pads, EPA's identified best available technology (BAT) economically achievable, based on similar cost data from other airports already collecting ADF through use of pads. Based on the application of those normalized costs, EPA determined that deicing pads are economically achievable at those airports subject to 60 percent collection requirements. However, because EPA so grossly underestimated the costs associated with installation and operation of deicing pads at those impacted airports, deicing pads cannot qualify as BAT.

(1) The Limited Data EPA Relied on to Estimate Deicing Pad Costs is Not Indicative of Costs at Other Airports.

To determine the costs associated with meeting the proposed 60 percent collection requirement, EPA developed average normalized cost estimates for installation of centralized deicing pads based on the costs to install deicing pads at three other airports. In the TDD, EPA calculated an average normalized cost based on installation costs and annual departures from three airports: Akron-Canton, Pittsburgh, and Minneapolis.⁷⁷ EPA's deicing pad costing methodology does not accurately predict the installation and operational costs of deicing pads at the airports potentially subject to the proposed 60 percent collection requirements that do not currently have pads.

In practice, airports may build deicing pads as part of a larger airport infrastructure project. EPA has not indicated whether any of the airports relied upon in determining deicing pad construction costs installed those pads as part of a larger infrastructure project or as standalone projects. If

⁷⁷ However, in the supporting memo, "Estimated Capital and O&M Costs for Centralized Deicing Pads" EPA-HQ-OW-2004-0038-0845 (March 2008), an average normalized cost was developed that also included costs from Cleveland. EPA then eliminated Cleveland from its final analysis, without explanation. We can only assume EPA did not include Cleveland because the airport does not meet EPA's proposed BAT. This would explain EPA's \$1.8 million assigned annual costs for that airport.

they were part of a larger project, simply pulling the deicing pad “portion” of the project out of total costs would be deceiving. For standalone projects, the cost will be significantly higher, not only because of the “economy of scale” factors associated with mobilization/demobilization, engineering, surveying, quantity purchasing, etc., but also because of the complexity of working within existing operating facilities. For instance, trenching and piping under a runway being constructed is significantly cheaper and easier than directional boring under an existing runway. Airports required to construct pads pursuant to the Proposed Rule, including the NSPS, would likely not be afforded the time and opportunity to incorporate pads into a larger project. EPA must account for any such difference.

EPA also has not analyzed or discussed whether the deicing pad installation costs reflect pad systems that meet EPA proposed technical specifications and comply with the collection of 60 percent of available ADF. If the deicing pad system costs EPA used in its cost analysis do not precisely meet the proposed requirements, then EPA has not properly costed its proposed collection standard.

(2) EPA Mistakenly Assumed Airports with Deicing Pads Already Comply.

Several airports subject to the proposed 60 percent collection requirements already operate deicing pad systems. EPA did not ascertain whether those airports actually collect 60 percent of available ADF. However, in estimating the cost impacts of the Proposed Rule, EPA mistakenly assumed those airports meet BAT and thus will have no costs under the Proposed Rule. There are a number of significant problems with this assumption.

First, some of those airports do not consistently collect 60 percent of applied ADF. For example, EPA assumed that, because Salt Lake City International Airport (SLC) currently operates 22 deicing pads, the airport would not incur costs under the Proposed Rule. However, with its current system, SLC only collects about 20 percent of available ADF, even with its pad system in place. The airport is in the process of constructing six end of runway deicing pads (with no guarantee they will achieve 60 percent collection). SLC currently is constructing the first three pads (each of which will accommodate 8 aircraft deicing positions) at an expected cost in excess of \$181 million. If we assume that the entire SLC pad construction project may reach \$400 million, without any guarantee of ultimate performance, then EPA’s estimated cost for this one airport alone is underestimated by at least \$400 million. That error alone could have significant ramifications on EPA’s determination of BAT.

Second, while an airport with deicing pads may meet the collection requirements, some airports do not have an adequate treatment system in place to actually treat what is collected to meet the proposed COD limit. EPA has wrongly assumed that all airports with deicing pads meet both the collection and treatment requirements.

Finally, because EPA has afforded such substantial discretion to the permitting authorities in deciding how airports must comply with the proposed collection standards, airports with deicing pads may be required to undertake additional infrastructure improvements. EPA has not shown that any airport with deicing pads currently meets the technical specifications in the Proposed Rule, giving the permitting authority the discretion to determine whether the alternative

specifications should be mandated. These determinations could change every five years, or when an airport must reapply for a new permit. In section II.J.2 we discuss the problems with granting such liberal authority to permitting authorities.

(3) EPA Should Not Normalize Deicing Pad Costs Based on Departures.

EPA estimated installed capital costs for centralized deicing pads by normalizing pad installation costs from three airports to aircraft departures. EPA then applied that normalized capital cost figure to departure data from the airports that are expected to have to install deicing pads under the Proposed Rule. EPA's costing analysis bears no rational relationship to real world capital construction costs.

First, the number of departures (either annual or deicing seasonal) is in no way solely indicative of the costs associated with installing deicing pads at an airport. The installation of such significant infrastructure will result in greatly varying costs airport-by-airport. Costs will rather be dictated by many factors, including the number, size and location of pads; available space; existing infrastructure; integration with other capital projects; etc. Departure data does not provide accurate cost estimations.

EPA also normalized deicing pad costs based on aircraft departures for three airports (perceived as small, medium, and large hub airports). However, the airports needing to comply with BAT are generally large hub airports that typically operate larger aircraft. Comparing the implementation cost for smaller airports is not necessarily reflective of the costs facing large hub (and space constrained) airports. According to EPA data, CAK has only 14,911 departures and uses only 60,246 gallons of ADF per year and is hardly indicative of the costs to be incurred by the large airports with significant ADF usage potentially required to install deicing pads under the Proposed Rule.

EPA claims to have normalized capital costs to deicing season departures. However, the actual departure data in Table 11-5 of the TDD is *annual* departures, not *deicing season* departures. Therefore, the normalized capital cost per deicing season departure metric calculated by EPA is too low. EPA then calculates capital costs at other airports by multiplying this falsely low metric of \$314.56 (based on annual departures) by deicing season departures at airports expected to be required to install deicing pads. Not only is departure data not indicative of deicing pad installation costs, but EPA mixed inconsistent data (i.e., annual departures to annual departures, or deicing season departures to deicing season departures) in its metric. EPA's metric is unworkable. We know for a fact that contractors would not base construction bids for a new deicing pad on departure data.

EPA developed annual O&M costs for deicing pads based on the annual O&M costs for the block-and-pump system at a single airport. Block-and-pump is a completely different collection technology and cannot be compared to the costs associated with maintaining deicing pads. In addition, EPA confuses the one airport for which deicing pad O&M costs are available. The TDD states that the available data is from Milwaukee's General Mitchell International Airport

(MKE). In fact, the cost data is from Minneapolis-St. Paul International Airport (MSP).⁷⁸ For unknown reasons, the O&M costs are normalized by number of outfalls. MSP actually has 5 outfalls, not 3 as indicated in the TDD. This error, again, results in an underestimate of the normalized cost per departure. In addition, EPA does not then multiply by the number of outfalls when determining deicing pad O&M costs at other airports. Approximate annual deicing pad O&M costs available in ACRP Report 14 range from \$80,000 to \$1.5 million.

c. Costs Basis Used in AFB Treatment System Cost Projections Are Inappropriate.

ACI-NA has identified a number of problems with EPA's methodology for assigning costs for the treatment technology identified as BAT.

In the supporting document "Estimated Capital and O&M Costs for Anaerobic Fluid Bed Treatment of ADF Contaminated Stormwater,"⁷⁹ EPA states that the capital and operating costs associated with AFB treatment facilities used as BAT can be described with a linear relationship to annual COD load at a given airport. This implies that the cost per pound for treatment remains constant regardless of the size of the treatment system.

ACI-NA assessed the EPA cost methodology and compared the approach to its understanding of the AFB design and cost methodologies used by the industry in preparing designs and opinions of probable cost for AFB deicer treatment systems. The following approach is based on deicer management system elements that are considered to be "Primary Treatment Components" and "Conveyance and Material Management Components." The design and cost analysis of the Primary Treatment Components can be performed through an understanding of the COD load to be treated, excluding site specific costs for items such as land availability/cost and geotechnical considerations. The design and cost of the Conveyance and Material Management Components are even more highly dependent on site specific infrastructure, collection requirements, and volumes of stormwater to be processed. It should be noted that, while the concerns presented below are expressed specifically for the use of AFB as BAT, they are generally applicable to any deicer management system that uses any type of deicer processing (treatment) system.

In typical application, the Primary Treatment Components of the AFB system are considered by designers of the treatment systems to include:

- *A pair of anaerobic fluidized bed reactors with an associated pair of media-solids separation units.* This pairing of reactors and separators is considered as the unit process for the system, with provisions made to use the two reactors in both parallel or series mode to support treatment requirements under different conditions. The use of two reactors is also important to achieve redundancy. The size and cost of the reactors and separators have the most direct relationship to COD load removed of the various system components.

⁷⁸ Memorandum, Estimated Capital and O&M Costs for a Block-and-Pump Collection System, EPA-HQ-OW-2004-0038-0844 (July 2007).

⁷⁹ Memorandum, Estimated Capital and O&M Costs for Anaerobic Fluid Bed Treatment of ADF Contaminated Stormwater, EPA-HQ-OW-2004-0038-0038 (March 2008).

- *Activated Carbon Media.* The design and operational parameters for the ALB system are based on use of activated carbon as the media used to support the attached growth process for the micro-organisms in the treatment reactor. The reactor heights, reactor flow distribution systems, and fluidization rates are based on research done to support development of the ALB activated carbon system. The cost of carbon has a direct relationship to COD load removed.
- *Interior Support Systems.* Systems that support the operation of the reactors and separators include flow regulation, nutrient supply, pH adjustment, gas collection, and water heating. Support systems also include electrical, standby power, controls, instrumentation, HVAC, office, and laboratory. Support systems within the treatment building have some relationship to COD load but not as direct of a relationship as reactor and separator size. This is especially true for small COD load capacity systems, where the support systems become a large part of the total cost and lead to a “minimum buy-in” cost concept for AFB systems.
- *Treatment Building and Exterior Treatment Support Systems.* This includes the building used to house the treatment unit process and support systems. There are elements located outside of the building, such as access and parking, and the gas flare/piping that are typically considered part of the treatment system. Like the Interior Support Systems, the Building and Exterior Support Systems have a less direct relationship to COD load. It should be noted that like the ALB system, it is acceptable to locate the reactors outside of the building, although this can result in additional challenges for the system operators.

There are a series of Deicer Management System components under the category of “Conveyance and Material Management Systems” that are not included by EPA. While these system components have a tangential relationship to treatment, their design and cost drivers are much more strongly related to site infrastructure, component location, effluent disposal options, site topography, collection requirements, and volumes to be processed than to COD load to be treated. Thus, they are highly variable site-by-site, meaning costs will vary significantly.

- *Conveyance from Collection to Storage.* Conveyance from collection to storage is one of the largest, if not the largest, cost component in many deicer management systems. Most conveyance systems are well beyond the 1,000 feet of piping assumed by EPA and in fact need to extend more than the entire length of runways (>10,000 feet).⁸⁰ The costs for conveyance from collection to storage are very site specific and require a separate analysis by EPA.
- *Storm Water Storage.* The AFB treatment systems are sized for a particular COD load removal capacity. While treatment system load capacity can affect storage capacity to a small degree, the required storage capacity is primarily a function of collected flow volumes and COD concentrations.
- *Equalization.* Storage structures upstream of treatment are sometimes provided with mixers to provide a small equalization of COD concentration. However, the effect of these mixers is relatively small because of the extreme day-to-day variation in influent COD concentrations sent to storage. The equalization effect for treatment is instead provided as an integral part of the flow management from

⁸⁰ See section II.G.5.d. where ACI-NA addresses EPA’s required piping estimates.

within the treatment system by controlling flow rates into the treatment system to hit target COD influent load rates as the COD concentrations vary. There is typically not a separate storage-based equalization system. EPA erroneously assumed a storage-based equalization aspect to treatment.

- *Conveyance from Storage to Treatment.* In most cases, it is most cost effective to locate storage near treatment (as is the case with the CAK systems). In many cases, this is not feasible due to land constraints and the need to locate system components in areas that have minimal effect on airport operations and safety. Conveyance from Storage to Treatment is also very site-specific and requires a separate cost analysis from EPA.
- *Biosolids Handling.* The AFB systems produce biosolids requiring disposal. While the production of these is part of the AFB treatment process, the handling of the solids is not part of the AFB BAT. The solids handling needs are site specific (e.g., could be discharged to POTW, could be dewatered on site, could be land applied) and costs for biosolids need to be considered separately from the AFB treatment costs. For larger system, these costs will be significant.
- *Effluent Disposal.* Treated effluent must be discharged either to a POTW or to surface waters. The costs for the disposal piping (and in some cases pumping) are not related to treated COD load, are very site specific, and can vary widely from one airport to the next. Those costs are influenced by location of the treatment system relative to the disposal point and the flow rates that are conveyed. The location-based considerations include length of the pipe or channel run, intervening infrastructure, topography, and soil characteristics. In cases where treated effluent pumping is required and intervening infrastructure must be navigated, the costs for effluent disposal can become significant.

EPA must include all costs, including those described above, to more accurately assess not only Primary Treatment Components that are primarily dependent on COD load, but also Conveyance and Materials Management Components that are primarily dependent upon site-specific factors.

In addition, EPA's estimated costs associated with AFB Treatment using a linear relationship is flawed when site-specific factors associated with Conveyance and Materials Management and siting are considered, especially for smaller facilities.

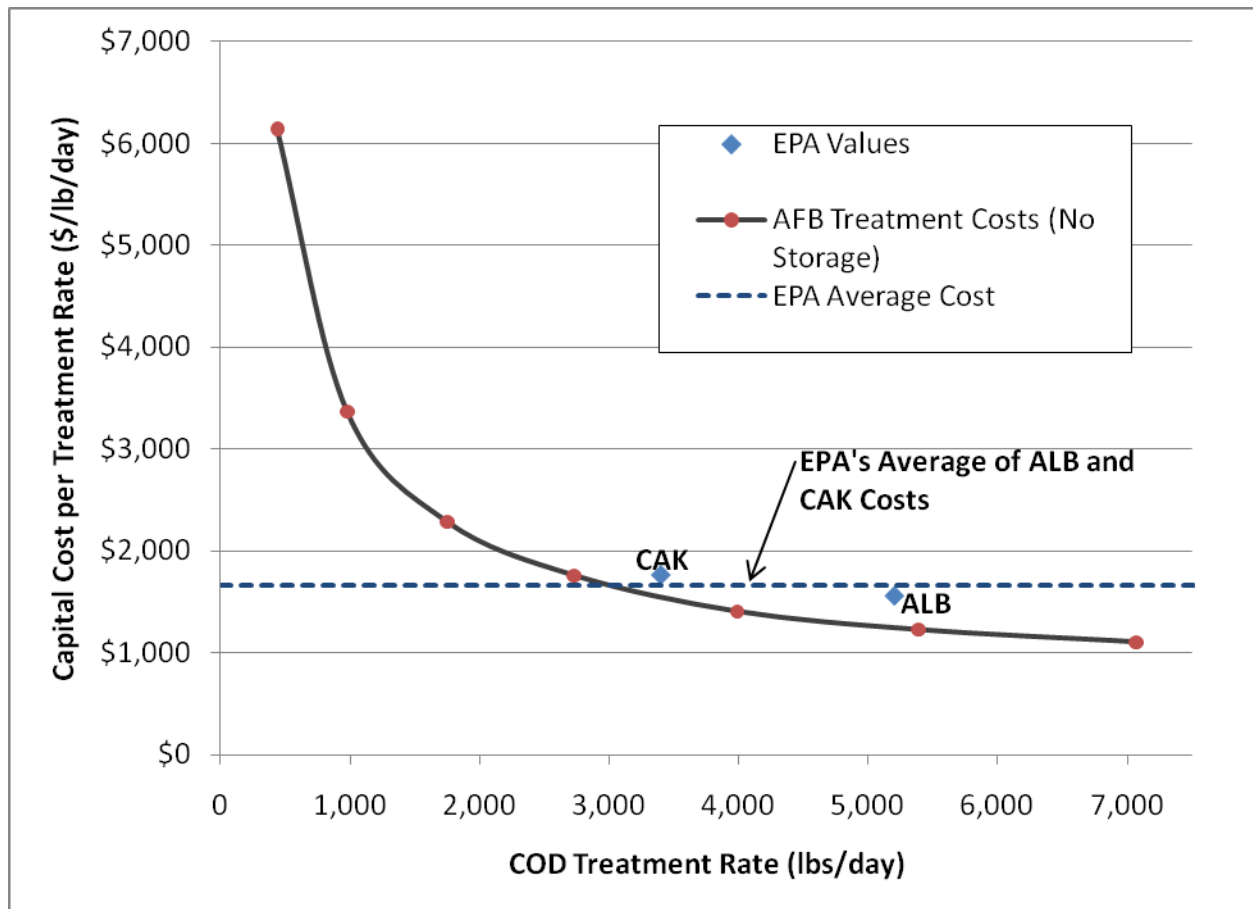
ACI-NA through consultation with industry consultants experienced in AFB design has developed the cost Figure 5 below that shows a more appropriate general relationship between cost and COD load for the Primary Treatment Components associated with treatment systems designed to treat less than 7,000 pounds of COD per day. This graphic was prepared by considering the following and illustrates that EPA significantly underestimated the costs associated with small systems.

- The range for a two-reactor AFB system based on the ALB design concept is 500 to 7,000 lbs/day COD removed. This range encompasses the three AFB systems that have been designed (ALB, CAK, and PDX)
- AFB systems with capacities less than 500 lbs COD removed per day are feasible, but pilot testing is required to establish design characteristics because of structural

support considerations and maintaining the relationships between media type, fluidization velocity, flow distribution in the reactor, and reactor height established by the research in the ALB system development.

- AFB systems with capacities greater than 7,000 lbs COD removed per day are also feasible, but the design would required multiple unit processes (i.e., systems with 4, 6, 8 or more reactors) because of practical issues in constructing and transporting individual reactors larger than 16 feet in diameter.
- The cost per pound of COD removal capacity increases rapidly for smaller load removal systems because a) economy of scale issues with the reactor and separator and b) the cost of the support and building systems is relatively constant, varying minimally with COD load removed.

Figure 5. Planning Level Opinion of Probable Capital Costs for Installation of AFB Systems Per Treatment Rates



d. On-Site ADF Conveyance and Storage Costs are Underestimated.

EPA made a number of inaccurate assumptions with regards to costs for on-site conveyance and storage of collected ADF. To determine the costs associated with ADF stormwater storage and piping, EPA relied on costs from a variety of airports, none of which may accurately portray the costs that may be incurred at other airports.

EPA calculated costs for retention ponds based on various pieces of data from different airports. EPA used Detroit Metropolitan International Airport data to calculate pond volume (relative to runway area). Denver International Airport was used as the basis for pond costs per gallon volume. Greater Rockford data was used to estimate the appropriate number and size of surface aerators. EPA cannot rely on a hodgepodge of airport data to calculate the costs of retention ponds, a cost driven by site-specific factors.

For those airports EPA deemed too space constrained to install retention ponds, EPA calculated costs associated with storage tanks. First, we fail to understand EPA's analysis for determining space was not available – if “more than 35 percent of their current area for active airport operations [is utilized], then the airport was not a candidate for a retention pond system.”⁸¹ It is unclear exactly what area EPA included in its analysis or what uses qualified land as available.

EPA's storage tank costing analysis is based on five (5) airports currently utilizing storage tanks. EPA does not distinguish whether such tanks are located above or below ground, which can greatly impact the associated costs. EPA again normalizes costs to departures, which is not an accurate indicator of necessary storage tank volume or cost. EPA also inexplicably dismisses two of the five pieces of data (Akron and Denver) in calculating storage tank volume per departure, yet goes on to rely on the storage tank installation costs from those same airports. Importantly, Akron is the only airport relied on that actually has an AFB system, EPA's BAT for ADF stormwater treatment.

The costs associated with storage (and treatment for that matter) are complicated by EPA's failure to propose a “design storm” threshold in the Proposed Rule. EPA's lack of a “design storm” event threshold means that an airport would be responsible for ensuring storage for deicing seasons that are very rare but would require massive storage capacity. Hence, in order to ensure 100 percent compliance with the Proposed Rule, airports would have to plan for storing ADF stormwater associated with, for example, a 100-year storm events or larger. EPA's failure to propose a design storm probably would lead to over-sizing all storage and treatment parameters, adding unnecessary cost and space utilization obligations. Interestingly, since proposing the Deicing ELGs, EPA has promulgated Construction & Development ELG standards that rely upon a 2-year/24-hour design storm standard for treatment. *See* 40 CFR § 450.22(b) and 74 Fed. Reg. 62,996, 63,049 (Dec. 1, 2009).

EPA also assumes 1,000 feet of piping per airport and an associated cost. The actual piping is likely to be much more than indicated. Several airports were surveyed regarding the estimated piping they expect will be necessary to meet the requirements of the Proposed Rule. The results are provided in Table 10. In addition, airports with existing deicing collection and treatment infrastructure provide an indication that the estimated 1,000 feet of piping is completely inaccurate. For example, Buffalo Niagara International Airport has 16,300 linear feet of piping, and Salt Lake City International Airport has 29,000 feet of collection piping (not including the piping that will be necessary for its 6 new deicing pads).

⁸¹ Memorandum, Estimated Capital and O&M Costs for Collection Ponds and Stormwater Piping, EPA-HQ-OW-2004-0038-0850 (February 2008).

Table 10. Estimated Length of Piping Necessary to Meet Proposed Rule Requirements.

Airport Code	Estimated Piping Needed (in feet)
ANC	15,000
BGR	6,000
CHS	4,000
CID	3,200
CLE	3,522
FWA	4,000
MDT	7,600
MSP	31,000
PHX	2,000
SEA	15,000
TUL	2,600

EPA assumed that “an airport with a pond already in place would use that for storage, as opposed to constructing permanent tanks”⁸² This is a poor assumption that artificially reduces costs. The flaw lies in failing to consider the loss of stormwater function that these ponds were originally built to provide. It also ignores the situation where such ponds may be used for storage of dilute runoff that is managed outside of the effort to meet collection performance standards.

EPA also appears to assume that airports with any deicer containment facilities have all of the necessary infrastructure to handle the deicer impacted stormwater. This assumption does not account for the fact that airports may need additional storage in order to meet the proposed treatment requirements.

EPA also does not analyze the ability of land constrained airports to meet required storage needs. EPA assumes underground storage is always an option for land constrained airports while giving no consideration to the physical ability to construct underground storage (e.g., depth to groundwater), the existing current underground storage for other purposes, or existing piping and utility infrastructure (e.g., fuel lines).

e. Increased POTW Capacity May Not Be Available to Airports.

Many airports currently discharge ADF-impacted stormwater to a publicly owned treatment works (POTW). Under the Proposed Rule, some of those airports may be required to collect and dispose of additional stormwater. EPA assumed that any airport currently discharging to a POTW will send any additional collected stormwater to the POTW rather than construct an on-site treatment facility. EPA cannot assume all POTWs are able to accept additional stormwater. Many airports discharging to POTWs have imposed flow or mass-based limits on their discharges. In order to discharge additional stormwater, additional storage may be necessary to ensure that effluent can be metered off to the POTW over a much longer period than airports currently have required. This adds cost to these airports.

⁸² 74 Fed. Reg. at 44,695.

f. The Costs Associated with Pavement Deicer-Related Requirements Are Underestimated.

EPA assumes that airports that currently use urea to treat pavement will switch to non-urea based pavement deicers, namely potassium acetate. EPA's costing analysis, however, provides inaccurate information, is not reflective of current conditions, and does not consider the costs associated with equipment purchases.

EPA received 2002-2005 urea and potassium acetate cost data from several airports. In its cost model, EPA excluded data from Reno-Tahoe International Airport, "because the unit costs were significantly higher than the reported costs at other airports."⁸³ EPA cannot simply exclude data because they exceed other airport costs, unless it provides a reasonable and logical explanation. EPA has not done so here. Costs may vary nationally based on availability, location, and other factors. If the costs are higher at one airport, it is likely indicative of the fact that other airports may also experience higher costs for various reasons. The bottom line is that airports will have to pay whatever the current price is to replace urea with potassium acetate (or a similar product). EPA cannot assume that the lowest price paid in the country will reflect the nationally available price after it finalizes any deicing ELG. The Reno-Tahoe data should be factored into EPA's analyses.

EPA's cost analysis is based on potassium acetate costs during 2002-2005. Current costs have risen significantly from the time period analyzed. Using the available data, EPA determined average potassium acetate costs to be \$2.81 per gallon. However, as shown in Table 11, airports are currently experiencing much higher costs. Prices may increase more based on increased demand to replace urea. EPA's analysis should reflect more current cost data.

Table 11. Sample Current Airport Potassium Acetate Costs

Airport	Current Potassium Acetate Cost (per gallon)
PDX	\$6.49
PIT	\$5.99
RNO	\$6.23
SLC	\$5.84
CMH	\$4.36
LCK	\$7.27

EPA also does not analyze the potential costs associated with acquiring new equipment for applying alternative pavement deicers. Urea is pelletized and requires a certain type of equipment to spread. Alternative products may be pelletized, but also may be liquid or require different equipment than that used for urea. Such new equipment costs should be accounted for in the Proposed Rule.

⁸³ Memorandum, Cost Comparison of Potassium Acetate and Urea Airfield Deicers, EPA-HQ-OW-2004-0038-0732 at 3 (March 2008).

g. EPA Did Not Consider the Value of the Land Where Collection and Treatment Will Occur.

EPA did not include the value of the land that is (or will be) used for deicing pads, equipment, storage, and treatment. As with all land, airport property has a value. By dedicating airport property for uses associated with ADF collection, storage, and treatment, it eliminates its availability for other uses (e.g., runways, taxiways, hangars, parking, etc), many of which may be revenue-generating. In addition, land constrained airports may be forced to acquire neighboring land, if possible. EPA should account for the opportunity cost associated with the land value in calculating deicing pad installation costs.

6. EPA Did Not Consider Costs of the Proposed New Source Performance Standards.

As proposed, the NSPS would impact any new airport or any existing airport intending to construct a new runway. EPA needs to consider the costs associated with implementation of the proposed NSPS. Information about planned infrastructure improvements is readily available. Significant infrastructure projects such as a new airport or runway are planned well in advance. EPA also asked airports about expected infrastructure projects in the airport questionnaires. FAA forecasts provides general information that can be used to estimate the number of new runways expected to be built within the next 20 years. Current forecasts estimate approximately ten new runways will open over the next ten years. This information can be used to estimate the costs associated with the proposed NSPS. If EPA intends to expand the definition of a “new source” beyond that proposed to include other airport construction projects, EPA must certainly assess the costs of NSPS.

H. EPA’s Financial Analysis Needs Revision

EPA assumes that all airports will use tax-exempt General Airport Revenue Bonds (GARBs) to finance the capital costs of complying with the rule. The necessary capital investments will include items like improvements in an airport’s drainage, runoff collection and storage infrastructure, constructing deicing pads (at a few large airports), purchase of glycol recovery vehicles and construction of infrastructure to facilitate their efficient use, and installation of plants to treat the collected runoff. Capital costs for compliance with the regulation will typically range up to several million dollars for airports facing the requirement to collect and treat 20 percent of available ADF, and several hundred million dollars or more at each of the seven large- or medium-hub airports that EPA projects as facing the 60 percent collection requirement and needing to construct dedicated deicing pads and associated supporting infrastructure.

Based on data provided by airports for the years 2003 to 2005, EPA projects that the GARBs assumed to finance these future capital investments will have an average real interest rate of 2.89%/yr (5.26%/yr nominal reduced by about 2.3%/yr to take out the impact of inflation). We

believe that this interest rate of 2.89%/year is much too low as an estimate of the real cost of the capital that airports will invest for compliance with the ELG.⁸⁴ We believe that:

- Most of the capital investments made for compliance with the ELG will not derive from GARBs. Instead, most airports will pay for the compliance capital investments by using AIP grants, PFCs, charges and fees, accumulated operating surplus, and savings from deferral of other planned capital investments;
- The cost of the funds obtained from these more likely sources is represented by their opportunity costs – the rate of return that an airport would have earned had this capital not been diverted to ELG compliance investments from its original intended use;
- To the extent that some airports do issue GARBs to finance the ELG compliance capital investments (e.g., perhaps some of the large airports facing capital costs in the range of \$50 to \$100 million or more for deicing pads and treatment facilities), they will likely have real interest rates substantially exceeding 2.89%/year.

We do not have a good estimate for the opportunity costs of financing compliance investments by non-GARB means, nor can we project what GARB rates will be during the compliance period for those few airports that will likely use them (we are confident only that GARB rates will likely be significantly higher than the 2.9% real figure that EPA assumes). Given this uncertainty, we suggest that EPA assume a real interest rate of 7%/year as the cost of financing compliance capital investments, as the Agency has done frequently for other ELGs that affect private sector entities. The remainder of this section provides further detail on these points.

1. Most Airports Are Unlikely to Use GARBs for Their ELG Compliance Investments.

EPA projects that the 60 airports the Agency believes will need improvements in order to meet the proposed 20 percent collection and treatment requirement will incur capital costs totaling

⁸⁴ Note that EPA's aim in the Economic Analysis should be to estimate the costs and impacts of the proposed regulation at the future time when compliance with the regulation will occur. As such, EPA should endeavor to assume as baseline conditions for the analysis (e.g., in making assumptions regarding the economic health of the regulated industry, interest rates, etc.) whatever conditions are judged most likely to prevail during the years from 2013 – 2018 or so when construction of infrastructure to achieve compliance will occur. EPA should not assume blindly that whatever conditions prevailed in 2003 – 2005 when the Agency's survey data were gathered will also prevail during the future period that should be the real focus of interest in the analysis. Survey data that EPA has obtained pertaining to conditions in 2003 – 2005 may be relevant in suggesting something about what conditions will be like in 2013 – 2018, but the required focus on this future period should prompt the Agency to consider ways in which the future period is likely to be different from 2003 – 2005, from the present, or from any other period from which data may be obtained. With respect to GARB interest rates during the 2013 – 2018 period that the analysis should address, for example, the Agency should consider whether interest rates during this future period are likely to be higher or lower than they were in 2003 – 2005, and whether they are likely to be higher or lower than they have been most recently. We submit that the best approach for projecting what interest rates may be during the future compliance period for the proposed ELG is probably to collect data on interest rates recently (e.g., 2008 and 2009) and then to judge (perhaps based on government projections or on the consensus of experts) how rates are likely to move from this level in the future.

\$168.9 million.⁸⁵ The great majority of these airports are small hubs and non-hubs. By EPA's estimate their average capital cost for ELG compliance will be approximately \$2.8 million each.

EPA projects that the 7 airports the Agency believes will need improvements in order to meet the proposed 60 percent collection and treatment requirement will incur capital costs totaling \$532.8 million.⁸⁶ Six of these airports are large hubs (ORD, EWR, IAD, BOS, JFK, LGA) and one is a medium hub (CLE). By EPA's estimate the average capital cost for ELG compliance for this set of airports will be approximately \$76 million each.

Frasca and Associates, LLC tracks airport bond issuances. They report 29 airport bond issuances during 2009 (through 12/7/09) totaling \$6.05 billion. The smallest issue was \$16 million (Gallatin MT Airport Authority, for BZN, a non-hub airport), the second-smallest was \$36 million (Metropolitan Nashville Airport, BNA, a medium hub), and the third-smallest was \$45.7 million (City of Philadelphia, for PHL, a large hub). It is clear, assuming that this most recent year is typical, that GARBs are highly unlikely to be used for capital investments as low as \$2.8 million, the average size capital investment that EPA estimates for airports needing to meet the proposed 20 percent collection/treatment standard.

In all, in 2009 there was one bond issue by a non-hub airport (for BZN), three for small hub airports (SBA, LGB, TUL), seven for medium hub airports, and 18 for large hub airports. This results in the following profile of bond issuance by airport hub size for 2009:

Table 12. Bond Issuance by Airport Hub Size

Airport Hub Size	# Bond Issues 2009	# Airports	Ratio of Issues to Airports
Large	18	30	0.600
Medium	7	37	0.189
Small	3	72	0.042
Non-hub	1	243	0.004

This information suggests that large hub airports frequently issue GARBs. In the most recent year, there were about 3 GARBs issued for every 5 large hub airports, and one might conclude that most large hub airports would likely issue GARBs every several years.⁸⁷ It is thus certainly possible that large hub airports could issue GARBs to finance large capital investments for deicing compliance (e.g., \$50 - \$100 million or more as might be needed to meet the proposed 60

⁸⁵ In Table VIII-1 of the Preamble, EPA indicates that Option 1 is projected to entail \$299.5 million in present value capital costs, and 67 airports will incur costs. The seven airports that are projected to incur costs for deicing pads account for an estimated \$130.6 million of the Option 1 capital costs (calculated from EPA's Airport Deicing Costing Database, "Option Costs Combined Output Table") thus leaving \$168.9 million in capital costs for the 60 airports that will incur costs to meet the 20% requirement but not the 60% requirement.

⁸⁶ Table VIII-1 indicates that all affected airports will incur a present value capital cost of \$701.7 million. All of the incremental capital cost for Option 3 relative to Option 1 -- \$402.2 million -- is incurred by the set of seven airports projected as needing to install deicing pads and treatment. Adding the capital costs of Option 1 for these seven airports (\$130.6 million) to the incremental costs of Option 3 relative to Option 1 (\$402.2 million) gives the total present value capital cost of \$532.8 million for these seven airports.

⁸⁷ Barring unusual circumstances, such as substantial deterioration in an airport's credit worthiness or reaching an airport's limit on total indebtedness.

percent capture and treatment requirements), and it is also likely possible for large hubs to finance smaller compliance capital investments for a year or two by other means, and then to include these capital costs in a larger planned GARB issue that covers multiple capital investment projects.

At the other end of the spectrum, most non-hubs and small hub airports rarely, if ever, issue GARBS. The data for 2009, above, suggests that an average small hub airport might issue a revenue bond only once every 25 years or so, or even less often. Non-hubs virtually never issue GARBS.

The same sort of picture is evident from data EPA cites in Tables 2-29 and 2-20 of the *Economic Analysis*.

Table 2-19 shows data developed by GAO for the period 2001 through 2005 indicating across all airports that half of total capital investment derived from airport bonds and half from other sources (e.g., AIP grants, PFCs, State and local contributions). Further analysis of the GAO data indicates that the pattern is quite different for large and medium hub airports from that for small and non-hub airports. For the larger airports, 63% of capital investment funds during this period derived from bonds, while the comparable figure for the smaller airports was only 15%.

Table 2-20 shows somewhat different figures developed by EPA from airport responses to the Agency's economic survey supporting the Proposed Rule, with responses weighted according to EPA's survey weights. The specific question asked of airports was: "Using readily available information, characterize the percentage of capital expenditures at this airport in the last five years accounted for by [airport bonds, AIP grants, PFCs and State and local contributions]." The responses obtained by EPA are shown below. Evidently the responses by many airports regarding sources of their capital frequently summed to more than 100%, and we have therefore re-scaled the final column of the table below to show the percentage of capital investments financed by airport bonds assuming a total for all financing methods equal to 100%.

Table 13. Sources of Airport Capital Expenditure Financing (2001 – 2005). EPA Survey Data.

Hub Size	Grants (AIP, Other)	"Pay As You Go" (Financed by PFCs, Rates/Charges, Other)	Airport Bonds	Total	Airport Bonds, re-scaled
Large hubs	17.4%	42.2%	46.8%	106.4%	44.0%
Medium hubs	40.1%	40.3%	44.8%	125.2%	35.8%
Small hubs	58.6%	39.2%	20.8%	118.6%	17.5%
Nonhubs	79.3%	34.4%	12.4%	126.1%	9.8%

This data from EPA suggests that airport bonds account for a minority of capital expenditure financing even from large hub airports (44.0%) and medium hub airports (35.8%).

Further information suggests that airports are less likely to use GARBS to finance capital investments for deicing compliance specifically than they are to use GARBS to finance capital investments generally. In general, AIP grants are limited to construction or improvements relating to aircraft operations, with commercial revenue-producing purposes (e.g., parking, concessions) not eligible. PFCs use is also limited to non-revenue producing projects. Capital investments relating to aircraft deicing are likely eligible projects for both AIP grants and PFCs.

In total, some 21% of all airport capital needs over the period 2009 through 2013 are projected to be for land-side projects that are generally ineligible for AIP grants or PFC funding.⁸⁸ If this 21% of all capital needs cannot be financed at all by use of AIP grants or PFCs, then these land-side projects must be financed nearly exclusively by GARBs.

Assuming for the purposes of an example that large and medium-hub airports obtain an average of roughly 40 percent of their total capital needs from GARBs (see the table above) and that 21% of all capital needs are land-side, then most GARB proceeds will be used for land-side projects ($21/40 = 52.5\%$ of total GARB proceeds), leaving a lesser share of the GARB proceeds (the remaining $19/40 = 47.5\%$) available for terminal and air-side projects. Terminal and air-side projects, including those relating to deicing compliance, will be financed even more predominantly by grants and PFCs than is the case for all airport capital investments. In our example, GARBs will account for only 24 percent of all terminal and air-side capital spending, including deicing-related projects, while they will account for nearly 100 percent of all land-side capital spending and 40 percent of total capital spending.⁸⁹ Based on this example, even for large and medium hub airports, GARBs seem likely to account for a relatively small share of all airport capital spending for the categories of projects within which deicing compliance is included.

It seems clear to us that GARBs will be used minimally to fund deicing capital investments at non-hub and small hub airports. It further seems likely that GARBs will finance well less than half of deicing capital investments at medium hubs, and probably slightly less than half of all deicing compliance capital investments at large hub airports. EPA should not assume that GARBs will be used to finance all compliance capital investments at all sizes of airports. Most of the capital investments made for compliance with the ELG will not derive from GARBs. Instead, most airports will pay for the compliance capital investments by using AIP grants, PFCs, charges and fees, accumulated operating surplus and savings from deferral of other planned capital investments.

2. EPA Must Acknowledge that the Cost of Funds Obtained from Sources Other than Garbs Is Represented by Their Opportunity Costs.

When airports pay capital costs from sources other than borrowed funds (e.g., grants, airline charges, PFCs, accumulated surplus), these other sources are not costless. Each of these other sources of capital are greatly overcommitted in the sense that airports have long lists of capital projects waiting to use these funding sources, and the total cost of the backlogged capital projects for a given airport typically far exceeds the projected rate at which these other funding sources will be available. For most airports, a new capital investment required for deicing compliance

⁸⁸ ACI-NA. *Airport Capital Development Costs, 2009 – 2013*. February, 2009.

⁸⁹ In this simple example, GARBs account for 40% of total large and medium hub airport capital spending. 21% of total capital needs are for land-side projects, and we assume that these needs will be met exclusively with GARBs. This leaves 19 percentage points worth of GARBs (40% less the 21% to be spent on land-side projects) to contribute toward the 79 percentage points worth of air-side and terminal needs, resulting in a GARB contribution equal to 24% of the capital available to meet air-side and terminal needs ($19/79 = 24\%$). In other words, in this hypothetical but perhaps not-too-far-from-the-truth example for large and medium hub airports, GARBs will contribute only 24% of the total capital that will be available for the general category of projects (air-side plus terminal) that includes deicing compliance facilities.

simply represents another call on the limited funding sources available that will somehow have to be accommodated. The compliance investment will likely be paid by deferring other projects that would otherwise have been funded from grants, airline charges, PFCs and/or accumulated operating surplus. The deferral of these other projects in order to pay the capital costs of compliance represents the opportunity cost of the compliance spending. By diverting capital from projects that would have been conducted in the absence of the compliance obligation, an airport loses the stream of future returns that would have been generated had the displaced projects occurred as planned.

It is difficult to know what rate of return an airport might have earned had this capital not been shifted to deicing compliance. The displaced or deferred investment might have been some profit-making land-side or terminal project (e.g., upgraded rental car facility, enhanced concession space in the terminal), in which case we might assume it would have generated at least some minimum hurdle rate of return for such projects, perhaps 10%/yr real or more. Or the displaced/deferred investment might have been for some safety or security purpose, in which case it might be assumed to generate an annual return exceeding the social rate of time preference. In view of such uncertainties, we suggest that EPA simply assume an opportunity cost for airport deicing compliance investments of 7%/yr on a real basis, consistent with OMB guidance and traditional Agency practice for private sector opportunity costs.

3. To the Extent that Some Airports Do Issue Garbs to Finance Their ELG Compliance Capital Investments, These Garbs Will Likely Have Real Interest Rates Substantially Exceeding EPA's Assumed Rate of 2.89%/Year.

Perhaps some of the large airports facing capital costs from the ELG in the range of \$50 to \$100 million or more for deicing pads and treatment facilities will choose to issue GARBs for some or all of these capital needs. We expect that whatever GARBs are eventually used will bear interest rates significantly higher than the Agency's assumed average of 2.89 percent real per year. We believe this for several reasons:

- The nominal coupon rate for municipal bonds (including airport bonds) was appreciably lower during EPA's survey period of 2003 – 2005 (the period over which the Agency's GARB rate was estimated) than rates in recent years (2008 and 2009) and also lower than rates are likely to be in 2013 – 2018 (the period during which investments for compliance with the ELG are likely to be made, and the period for which EPA should be estimating likely interest rates). Using the Daily Bond Buyer's index of 25 revenue bonds as an indicator of trends in tax exempt revenue bond interest rates, average rates were 5.07 percent for 2003 – 2005 and 4.96 percent for 2005 alone.^{90 91} In contrast,

⁹⁰ See http://www.bondbuyer.com/marketstatistics/search_bbi.html?details=true for values for this index through 2009.

⁹¹ EPA estimated the assumed average nominal GARB rate of 5.26 percent for airport bonds specifically by averaging the survey responses obtained in 2006 from airports regarding the interest rate on the most recent GARB they had issued. We expect that such responses would thus pertain mostly to bonds issued in 2005, and less so to bonds issued in 2004 or 2003. (Airports that had not issued GARBs during this period were apparently assigned the average interest rate that was reported by airports that had issued GARBs during this period. EPA thus evidently assigned to all the smaller airports that had not issued GARBs an interest rate derived as the average across the mostly larger airports that had issued GARBs. This approach is inappropriate given the substantial evidence that

nominal rates for this index were higher for 2008/2009 at 5.39%, and will likely be significantly higher still in the future.⁹²

- The inflation rate was higher in EPA's survey period of 2003 – 2005 than rates in recent years. Hence EPA's adjustment to remove the impact of inflation (estimated via the Consumer Price Index) from nominal bond rates made estimated real interest rates in 2003 – 2005 even lower relative to real 2008/2009 rates than the comparison between nominal rates in 2003 – 2005 and nominal rates in 2008/2009 would suggest. The average December-to-December increase in the CPI over 2003 to 2005 was 2.87 percent; for 2005 alone the CPI increase was 3.4%, and for 2008 and 2009 the average increase was 1.4%.⁹³ Applying this inflation adjustment to the nominal interest rate for the Bond Buyer's revenue bond index gives real rates for the revenue bond index of 2.20% for 2003 – 2005, 1.56% for 2005 alone, and 3.99% for 2008/2009.⁹⁴ Thus the real interest rate for a set of representative tax exempt revenue bonds was some 1.8% to 2.4% higher in 2008/2009 than it was during EPA's chosen period of 2003 – 2005. Again, these rates are likely to be higher still in the future.⁹⁵
- If the real interest rate for tax exempt revenue bonds was some 1.8% to 2.4% higher in 2008/2009 than it was during EPA's chosen period, then the real interest rate for GARBs specifically was also likely several hundred basis points higher during the most recent years of 2008/2009 than it was during the 2003 – 2005 period that EPA surveyed. We believe that the average quality of airport debt has probably deteriorated since 2003 – 2005 relative to the quality of municipal revenue bonds generally. The spread between GARB interest rates and the Bond Buyer index for revenue bonds generally has likely increased since 2003 – 2005.

EPA cites regarding the much greater credit-worthiness of large airports relative to small ones.) EPA's 5.26% estimate thus pertains largely to bond market conditions in 2005, and we thus focus primarily on comparing the Bond Buyer index values in 2005 (the time period that EPA likely accessed for the bulk of the Agency's GARB rate data) against the index values in 2008/2009.

⁹² Most reputable forecasters expect that the large projected Federal budget deficits will result in U.S. interest rates that are significantly higher in the future than they are now. The Congressional Budget Office's most recent official projections (August, 2009), for example, are that the interest rate for the ten-year Treasury note will increase from 3.3% in 2009 to 4.1% in 2010 to 4.8% in 2012 – 2013 and to 5.5% in 2014 – 2019. See <http://www.cbo.gov/ftpdocs/105xx/doc10521/econproj.pdf>.

⁹³ See <http://www.bls.gov/cpi/tables.htm>.

⁹⁴ These estimated real interest rates are calculated, using EPA's procedures, as follows. The 2003 – 2005 nominal average interest rate for the revenue bond index was 5.07%. Subtract the annual average rate of increase in the CPI over this period (2.87%) to obtain a real interest rate of 2.20%. The 2005 nominal average interest rate for the revenue bond index was 4.96%. Subtract the annual average rate of increase in the CPI in 2005 (3.40%) to obtain a real interest rate in 2005 of 1.56%. The 2008 – 2009 nominal average interest rate for the revenue bond index was 5.39%. Subtract the annual average rate of increase in the CPI over this period (1.40%) to obtain a real interest rate of 3.99%.

⁹⁵ Using the CBO's most recent projections again, and applying EPA's procedure of subtracting the percentage increase in the CPI as a means of converting from nominal to real interest rates, we obtain the following CBO projections regarding the real rate of interest on the ten-year Treasury note: 2010: 2.4% (4.1% nominal less 1.7% CPI increase); 2011: 3.1% (4.4% nominal less 1.3% CPI increase); 2012-2013: 3.7% (4.8% nominal less 1.1% CPI increase); 2014-2019: 3.6% (5.5% nominal less 1.9% CPI increase). Again, future rates are projected as being significantly higher than current rates.

Based on survey data for 2003 – 2005, EPA estimated the real interest rate on GARBs to have averaged 2.89 % over that period. Apparently without considering any possible changes over time in this interest rate, EPA assumes that airports using GARBs to finance ELG compliance investments over the 2013 – 2018 timeframe will pay an identical 2.89%/year real interest rate. We believe, in contrast, that GARB rates have increased since 2003-2005 to roughly 4.7% real during 2008/2009, and that they are likely to increase further still by 2013-2018. EPA should adopt more realistic projections for the real interest rates likely to be paid by those airports that use GARBs to finance their ELG compliance investments some 3 to 8 years from now.⁹⁶

4. The Metrics that EPA Uses for Economic Impact Analysis for Airports Should Be Revised

For each airport, EPA evaluates the economic impact of the proposed deicing requirements by considering two financial measures:

- *Ratio of annualized compliance costs to operating revenues.* EPA compares each airport's projected annualized compliance cost against its annual operating revenues. If the ratio is less than 1 percent, the regulation is considered generally affordable; if the ratio is between 1 and 3 percent the regulation is considered affordable if only a few airports are affected and the majority incur costs less than one percent of revenues; and if the ratio exceeds 3 percent, the regulation is considered to place a heavy burden on the airport.
- *Debt service coverage ratio (DSCR).*⁹⁷ EPA presumes that each airport will finance its capital costs of ELG compliance by issuing general airport revenue bonds (GARBs). The Agency then evaluates the impact of issuing these GARBs on the airport's debt service coverage ratio. This impact is calculated under each of two assumptions: 1) the airport passes 100% of annualized ELG compliance costs through to its airlines in increased landing fees; 2) the airport passes none of the compliance costs through to airlines, instead absorbing all the costs. EPA counts it as a potentially significant adverse impact of the regulation if an airport's projected ELG compliance costs will cause its DSCR to decline from more than 1.25 prior to the regulation to less than 1.25 after the regulation under either of the two pass-through assumptions.

We have several concerns about these two metrics for evaluating economic impacts.

⁹⁶ We reiterate that we expect few airports, other than perhaps some large hubs, to use GARBs for the bulk of their ELG compliance capital investments.

⁹⁷ The DSCR is the ratio between an airport's net revenues and its debt service payments. Airports and/or their owners are typically required by enabling legislation or other covenants to maintain annual net revenues (i.e., revenues less costs) that exceed their annual debt service costs (i.e., annual principal and interest payments on their outstanding debt) by some specified amount or percentage. For most airports for which EPA had data, the specific requirement is that the DSCR must remain above 1.25: annual net revenues must be at least 25% greater than annual debt service costs; if not, the airport will be in default on its debt.

- a. The ratio of compliance costs to an airport's total operating revenues is not a meaningful measure for airport financial impact analysis. Such a measure would be more appropriate if the comparison were between compliance costs and the airport's aeronautical revenues specifically

EPA does not have a particularly strong rationale for using 1% or 3% of total operating revenues as an indication that regulatory costs are problematic for airports. The stated rationale for using a revenue test of this sort rests on EPA's *Guidelines for Preparing Economic Analyses* and on analogizing from the Agency's tests pursuant to the Small Business Regulatory Enforcement Act (SBREFA) for a significant impact to a substantial number of small entities.⁹⁸

- In fact, the proposed revenue test represents the second potential approach suggested in EPA's *Guidelines for Preparing Economic Analyses*. The first approach suggested in the *Guidelines* is to assess "annualized compliance costs as a percentage of annual costs for the service," using 1% as the threshold for significant burden.⁹⁹ Thus, to be consistent with the *Guidelines*, perhaps EPA should compare an airport's incremental increase in deicing cost due to the proposed rule against that airport's baseline deicing cost. Has EPA done such an analysis? What would it show? By what percentage does the proposed rule increase baseline deicing costs?
- EPA's rationale for extending the SBREFA impact thresholds for small entities (i.e., 1% of revenues denotes a potential impact, 3% of revenues denotes a likely significant impact) to large entities also is not convincing. EPA has applied these thresholds in countless previous regulatory impact analyses for small entities, but has rarely, before now, extended them also for application to large entities. Why should EPA change and do this now?

We would have preferred that EPA devise an economic impact metric for this regulation that is more meaningful for airports and more consistent with the way that airports themselves would evaluate whether a new set of externally mandated costs would cause significant adverse economic impacts.

EPA was previously on track to use some impact metrics that would be more meaningful and familiar in the field of airport finance. In an earlier memo, EPA indicated that the Agency intended to estimate the impact of the Proposed Rule's costs on the cost-competitiveness of airports relative to each other by assessing the impact of compliance costs on landing fees and on cost per enplaned passenger.¹⁰⁰ As this EPA memo stated:

"A major concern of some airports is that increased airport costs could make it uneconomic for airlines to operate from that airport, and the airlines would find lower cost alternatives. ... The percent increase in

⁹⁸ EA at 3-6 and 3-7.

⁹⁹ U.S. EPA, *Guidelines for Preparing Economic Analyses* at 157 (September 2000).

¹⁰⁰ Memorandum, Revised Draft Economic Impact Methodology, EPA-HQ-OW-2004-0038-0563 (November 2006).

landing fees will be one measure of the rule's impact. ... Airline cost per enplaned passenger (CPEP) is a measure commonly used by industry to determine whether an airport is competitive with other airports, and thus attractive to airlines, or if the airport is becoming too costly for airlines to use.”¹⁰¹

These are exactly the concerns that airports have about the compliance costs associated with EPA's Proposed Rule. These compliance costs may either be absorbed by airports, passed on to the flying public (via PFCs), or passed on to the airlines serving the airports (and then perhaps be further passed on to the airlines' customers). The airports significantly affected by the proposed regulation fear that any of these three alternatives will reduce their attractiveness to airlines and the public. An airport that absorbs the ELG compliance costs reduces the funds it has available to modernize, expand to meet demand, and meet additional regulatory requirements (e.g., safety, security). An airport that passes costs on to the public via PFCs makes itself less attractive by, in effect, raising the price of tickets for all flights using the airport.

An airport that passes costs on to its airlines makes itself less attractive to these airlines, potentially inducing these airlines to shift flights to other airports, reduce seasonal service to the airport, or reconsider the hub status of the airport. To cite one example of these potential adverse impacts, the management of Greater Rockford (IL) airport is very concerned that its ELG compliance costs – if passed through as landing fees – will seriously threaten the continuation of its already economically tenuous commercial air service to Chicago. If some of the Chicago flights are dropped, landing fees will need to be raised on all the remaining flights, and the existence of all commercial service to the airport will then be at risk.¹⁰² And, as another example, Logan Airport in Boston is very concerned that the high ELG compliance costs it will face will drive further passengers and flights to nearby competitor airports in Manchester, NH, and Providence, RI.

EPA should develop impact metrics that are illuminating with respect to serious and real potential impacts such as these, instead of metrics like the 1% and 3% thresholds that are transferred arbitrarily to airports from some other context.

We believe that impact on landing fees and cost per enplaned passenger have promise as better metrics for evaluating airport impacts than those metrics that EPA is currently using. Both of these measures are commonly calculated by airports, and airports consider these measures when deciding whether or not to undertake activities that will increase airport costs. We must stop short of a full endorsement of these two measures, though, because we do not currently see a benchmark or threshold for either of these measures that can serve across different airports to consistently divide significant impacts from insignificant ones. An increase in landing fees that may be very harmful to one airport might have little impact at another. Airports' competitive positions vary widely.

¹⁰¹ *Id.* at p. 5-6.

¹⁰² An increase in landing fees or cost per enplaned passenger can have a snowballing effect. If fees are increased and flights/passengers decline as a result, fees will need to be increased even more to hold revenues constant with decreasing flights and passengers, which will cause loss of more flights/passengers, and so forth.

ACI-NA would be willing to work with EPA in an attempt to develop thresholds associated with these two potential measures that could differentiate significant from insignificant impacts. If EPA is going to continue to use a comparison between an airport's annualized ELG costs and the airport's annual revenues as an economic impact metric, we strongly suggest that revenues in the denominator of this comparison be defined as aeronautical revenues only. Few airports will look beyond aeronautical revenues as a source for paying airfield costs such as deicing compliance costs. The airports using "mixed" or "hybrid" approaches financial management, and even the few airports that use the "residual" approach will treat airfield operations (including deicing) as an explicit cost center, and will set airline fees such that airfield revenues cover airfield costs. EPA believes for the year 2004 that at least 66% of all airports that responded to the Agency's survey treated airfield operations as an explicit cost center in this manner.¹⁰³ This percentage has undoubtedly increased in recent years as new agreements have been negotiated in a context where airports are much more credit-worthy than airlines.¹⁰⁴

All airports that treat airfield operations as a cost center will collect fees from airfield users (mostly airlines, but also cargo and other users) sufficient to cover these costs. Only those few residual approach airports could be subsidized by revenues from non-airfield sources. An airport's non-airfield revenues are irrelevant in this context. In evaluating the degree to which an airfield cost increase (e.g., for deicing compliance) will affect the economics of an airport, EPA should compare this cost against the airport's aeronautical revenues, not the airport's total revenues. We believe that this measure – annualized compliance costs as a percentage of aeronautical revenues – would be a much better screening measure for economic impacts than the comparison against total airport revenues that EPA has adopted.

Note that this measure that we are suggesting EPA use is closely related to the cost per enplaned passenger (CPEP) measure that EPA proposed in the Agency's previously cited 2006 memo on "Revised Draft Economic Impact Methodology" for the ELG. EPA proposed in this memo to estimate an airport's CPEP in the baseline, before the regulation ($CPEP_{pre}$), and to compare that against post-regulatory CPEP ($CPEP_{post}$). $CPEP_{pre}$ and $CPEP_{post}$ were to be estimated as follows:

$$CPEP_{pre} = \frac{(\text{Total airport operating revenues} \times \text{Percent attributed to airlines})}{\text{Enplaned passengers}}$$

and

$$CPEP_{post} = \frac{(\text{Total airport operating revenues} \times \text{Percent attributed to airlines}) + \text{Annualized compliance costs}}{\text{Enplaned passengers}}$$

¹⁰³ See pages 2-22 through 2-24 of the Economic Analysis. The 66% figure counts only the 78 (weighted) airports using a compensatory approach and the 62 of the 73 airports with a mixed approach that determine airline fees for airfield operations based on the actual cost of running these areas. The 66% figure for 2004 would be higher if some of the airports using "other" funding methods (see Table 2-12 of the Economic Analysis) also treated airfield operations as an explicit cost center.

¹⁰⁴ Tom Browne, Trillion Aviation, "Airport Finance 101" Presentation at the ATA/ACI-NA Deicing Management Conference, July 25, 2008.

The first possibility the Agency suggested was to “calculate post-regulatory CPEP as a percent of pre-regulatory CPEP”, or

$$\frac{[(\text{CPEP}_{\text{post}}) - (\text{CPEP}_{\text{pre}})]}{(\text{CPEP}_{\text{pre}})}$$

Substituting into this expression the definitions of CPEP_{pre} and $\text{CPEP}_{\text{post}}$, simplifying terms and assuming that the regulation causes only small changes in the airport’s total operating revenues, percent attributed to airlines and number of enplaned passengers, we obtain the following:

$$\% \text{ change in CPEP due to the regulation} = \frac{\text{Annualized compliance costs}}{(\text{Total airport operating revenues} \times \text{Percent attributed to airlines})}$$

Note that the denominator, the expression within the parentheses, (Total airport operating revenues x Percent attributed to airlines) is similar in concept to the airport’s aeronautical revenues. In effect, the first measure that EPA originally suggested for evaluating economic impacts from the ELG on airports – the percentage change in cost per enplaned passenger – is nearly identical to the measure that we are now proposing – the ratio between annualized compliance costs and the airport’s aeronautical revenues.

- b. We have several objections to EPA’s approach for evaluating the impact on an airport’s debt service coverage ratio, the Agency’s second economic impact measure

Although use of this measure is appropriate insofar as most airports are required to track debt service coverage ratio as a key measure of airport financial health, it is an inappropriate choice as one of only two key measures for this regulation because, as we discuss elsewhere in these comments, most airports will not use GARBs or other forms of debt to finance deicing compliance capital investments.

EPA’s procedure for calculating the change in an airport’s debt service coverage ratio (DSCR) is acceptable in broad outline. However, we have the following concerns:

- The interest rate that airports will actually pay on any GARBs issued in the 2013 – 2018 time frame for ELG compliance will likely be much higher than the avg of 2.9% real that EPA assumes in the Economic Analysis. See our comments on this elsewhere also.
- EPA should perform the DSCR analysis on a nominal rather than a real basis, using likely nominal interest rates as of the 2013 – 2018 time period rather than real rates as of this period. EPA should consider performing the analysis on a real basis as we suspect EPA intends. Because the interest an airport will actually pay on any additional indebtedness incurred for ELG compliance (the first half of the DSCR calculation) will be paid in nominal, inflating dollar terms and the nominal interest rate that will drive these payments will include a substantial premium representing inflation. On the other hand, the second half of the DSCR

calculation involves an airport's net revenues, and these are not likely to increase over time with the general rate of inflation (as measured by EPA via the CPI).

- For those airports that did not issue GARBs during EPA's 2003 – 2005 ELG survey period, EPA assumed that the interest rate they would have paid on GARBs would have been equal to the average interest rate paid by airports that did issue GARBs during this period and reported this rate in their survey response. This assumption is inappropriate. It is generally smaller airports that would not have issued a GARB during this period. Assigning them the same (low) interest rate as the average across the generally larger, financially healthier airports that did issue GARBs then (large airports issue GARBs frequently, small airports issue them rarely) is inappropriate. Note the data EPA provides in the Economic Analysis to the effect that larger airports are generally financially healthier than smaller airports.

I. EPA's Specific Pollutant Analyses and Reliance on COD as a Regulatory Basis Hides the Underlying Fact that EPA's Proposed Rule is Highly Cost-Inefficient and Compares Unfavorably with Prior ELG Rulemakings.

1. Overview

The Proposed Rule is not cost-effective for controlling any of the classes of pollutants in airport deicing wastewaters – toxic pollutants, nutrients, or conventional pollutants, including oxygen-demanding pollutants. EPA obscures this fact by claiming that the regulation addresses COD as a member of a fourth class of pollutants – nonconventional pollutants – for which traditional cost-effectiveness benchmarks do not exist. In fact, COD is one of several possible alternative measures of oxygen demand, and the cost-effectiveness of this Proposed Rule with respect to abatement of oxygen demand should be evaluated relative to traditional ELG cost-effectiveness benchmarks for conventional and oxygen-demanding pollutants. EPA should not be able to disregard the basic cost-effectiveness – or in this case cost-ineffectiveness – of its Proposed Rule by manipulating legal technicalities to hide behind a mirage intentionally created through its “nonconventional” pollutant choice.

2. EPA's Traditional Approach to Cost-Effectiveness Analysis for ELGs

EPA has traditionally evaluated and considered the cost-effectiveness of its ELG regulations. Cost-effectiveness is defined generally as the cost of compliance with the regulation relative to the effluent reduction that is achieved by the regulation: the cost per pound of pollutants abated. EPA has used the cost-effectiveness of ELGs as an important measuring tool since at least the late 1970s. Subsequent to the Consent Decree with NRDC in 1976, the Agency increased the focus in ELGs on toxic pollutants and on pretreatment standards for those pollutants that potentially pass through or interfere with POTWs (*e.g.*, many toxic pollutants) and developed a procedure for judging the cost-effectiveness with which an ELG abates toxic pollutants.

The CWA Amendments of 1977 added the BCT cost test.¹⁰⁵ Subsequently, EPA began implementing the two-part BCT cost test, which represents a cost-effectiveness analysis for judging whether or not an ELG can require more stringent controls for conventional pollutants than Best Practicable Technology (BPT).¹⁰⁶ When developing the ELG for the Meat and Poultry Products point source category in 2004, EPA found a new situation where the pollutants of greatest concern discharged by the to-be-regulated industry were nutrients rather than toxic or conventional pollutants. The Agency then devised a procedure for judging the cost-effectiveness with which an ELG abates the discharge of nutrients as a class of pollutants.¹⁰⁷

In general, the cost-effectiveness tests applied by EPA involve estimating the cost at which the proposed ELG abates a pound of these sorts of pollutants and then comparing this “standardized” cost for the ELG being evaluated against past benchmarks that denote an upper bound to the “standardized” cost that previously were deemed “acceptable.” More specifically:

- *For toxic pollutants.* EPA evaluates the cost per toxicity-weighted pound for the quantity of toxic pollutants (priority pollutants plus nonconventional pollutants) abated by the BAT ELG option under consideration against the highest such figure at which toxic pollutants have been abated in previous ELGs. At present, the cost-effectiveness benchmark for toxic pollutants is \$404 per toxicity-weighted pound-equivalent (TWPE), expressed in year 1981 dollars, which is roughly equivalent to \$857 per TWPE in year 2006 dollars.¹⁰⁸ Any ELG for which the proposed BAT option would abate toxic pollutants at a cost exceeding this amount is judged to be not cost-effective in terms of toxics removal. In other words, it would cost more per pound to abate toxic pollutants than the least cost-effective (or most costly) previous ELG BAT requirement that EPA has promulgated (the Electronics I ELG, promulgated in 1983).
- *For conventional pollutants.* EPA evaluates the cost at which the proposed BCT ELG option abates conventional pollutants. This cost per pound at which an advanced treatment technology can remove conventional pollutants in the to-be-regulated industry is then compared against the cost per pound at which advanced control technologies can control conventional pollutants at POTWs. If the cost per pound for the proposed BCT option to abate the discharge of conventional pollutants exceeds the “POTW test” figure of \$0.25 in 1976 dollars (equivalent to about \$0.86 in 2006 dollars¹⁰⁹), the BCT option is judged not “cost-reasonable” and cannot be promulgated. Congress’ rationale underlying this cost-reasonable test was that regulated industries should not be required to implement advanced controls for conventional pollutants that are less cost-effective than advanced controls available at POTWs for abating these same pollutants.¹¹⁰

¹⁰⁵ See 33 USC § 1314(b)(4).

¹⁰⁶ See 51 Fed. Reg. 24974 (July 9, 1986)

¹⁰⁷ See 69 Fed. Reg. 54,475 (Sept. 8, 2004).

¹⁰⁸ The conversion from 1981 dollars to 2006 dollars is accomplished by applying EPA’s traditional inflation adjustment procedure based on the *Engineering News Record* historical construction cost index.

¹⁰⁹ The conversion from 1976 dollars to 2006 dollars is accomplished by applying EPA’s traditional inflation adjustment procedure based on the RS Means historical cost index.

¹¹⁰ The BCT cost test also includes a second part that must be passed if the BCT option is to be promulgated, involving essentially the ratio of the incremental cost for advanced controls in the to-be-regulated industry to the incremental cost for BPT controls in the industry. We need not discuss this second part of the test here; the cost-

- *For nutrients.* EPA concluded in the nutrient cost-effectiveness analysis for the Meat and Poultry Products ELG that BAT standards abating nutrients at a cost per pound of less than several dollars per pound of nutrients would be cost-effective. The benchmark for cost-effectiveness was not established as a specific number; it was instead estimated as a range from roughly \$1 to \$10 per pound as representing the range of costs at which some POTWs have been required to implement advanced controls for total nitrogen.¹¹¹

EPA evaluates the cost-effectiveness of the Agency's proposed ELGs and compares the resulting cost per pound figures against benchmarks for the following reasons:

- The BCT cost test is a statutory requirement. In establishing the POTW benchmark part of the test, Congress was concerned that advanced control requirements for industry for conventional pollutants should not be less cost-effective than the advanced control requirements for POTWs, which provide most of the nation's control for these pollutants.
- EPA recognized that ELGs will be developed for scores of industries (ELGs have now been promulgated for more than 56 different industries). The Agency has rightfully been concerned with equity across these industries – no industry should be required to abate pollutants at a cost per pound that is “out of bounds” and exceeds the highest unit cost imposed on a previously regulated industry. The Agency also may be concerned with efficiency, in the sense that requiring controls for a to-be-regulated industry at a cost per pound that is “out of bounds” with respect to all previously regulated industries suggests that additional pollutant reductions could likely be obtained at less cost by tightening existing regulations for already-regulated industries rather than adopting extreme requirements for the to-be-regulated industry. This is particularly applicable over time because EPA already has regulated the “low hanging fruit” and now is focusing on less-traditional point source categories that generate far less mass of pollutants in more diffuse ways, particularly with regard to stormwater.
- The White House (in Executive Order 12866) and OMB (in its Circular A-3 “Best Practices” guidance) have long required Federal agencies to perform cost-effectiveness and/or benefit-cost analyses in order to improve regulatory decision-making.

3. The Proposed Airport Deicing ELG Is Not Cost-Effective for Toxic Pollutants

effectiveness test that is important for our purposes is the comparison of industry's cost per pound for abatement of conventional pollutants at BCT against the POTW test figure of \$0.25 per pound in 1976 dollars or \$0.86 in 2006 dollars.

¹¹¹ Some commenters disagreed with EPA's choice of a benchmark at a cost per pound figure at which POTWs are occasionally required to implement advanced controls for nutrients (typically for water quality reasons as opposed to technology-based reasons). Most POTWs in fact have not been required to implement advanced controls for nutrients when facing costs at this benchmark level. EPA's nutrient benchmark thus is not fully comparable with the benchmarks for toxic and for conventional pollutants, which represent the highest figures at which all dischargers in an industry have been required to adopt advanced controls. For POTWs, EPA's nutrient benchmark figure represents the cost per pound at which some (a minority of) dischargers in the industry have been required to implement advanced controls.

The proposed BAT requirements applicable to EPA's aircraft deicing proposal would abate priority and nonconventional pollutants at a toxicity-weighted cost per pound of nearly \$12,000/TWPE. This far exceeds the \$857/TWPE¹¹² representing the most expensive previous ELG that abated toxic pollutants. EPA has no justification for subjecting the aviation industry to an ELG that is 12 times more costly than the most costly prior ELG, from the perspective of cost-effectiveness in abating discharge of toxic pollutants. Neither the entire rule nor either of the two major sections of the proposed rule (provisions regarding ADF and provisions regarding pavement deicing) is cost-effective with respect to abating toxic and nonconventional pollutants. The following table illustrates this analysis.

Table 14.

Cost-Effectiveness for Toxicity

	Cost (million 2006\$)	Removals (TWPE)	Cost per TWPE
ADF provisions	\$87.50	3,441	\$25,427
Pavement provisions	\$3.80	4,253	\$893
Entire proposed rule	\$91.30	7,694	\$11,866

Compare against \$857 per TWPE (in 2006 \$), highest figure among previous ELGs

An Excel workbook file is attached that provides the data, references and procedures for these toxicity cost-effectiveness calculations, as well as for the calculations (presented below) regarding cost-reasonableness for conventional pollutants and for nutrients. Note that all of these calculations are based on EPA's estimates of costs and pollutant removals for the different classes of pollutants affected by the proposed ELG. We believe, as detailed elsewhere in these comments, that EPA has significantly underestimated the costs of the Proposed Rule and overestimated the pollutant removals that the Proposed Rule will achieve. Hence, the cost per pound or per pound-equivalent at which the Proposed Rule achieves these removals is substantially underestimated when relying upon EPA's estimates. If finalized as proposed, the Airport Deicing ELG would be significantly more cost-ineffective than represented above.¹¹³

¹¹² Expressed in 2006 dollars, to be consistent with the costs for EPA's Proposed Rule.

¹¹³ Note also that we performed these toxicity cost-effectiveness calculations using freshwater toxicity weighting factors for each of the priority and nonconventional pollutants for which EPA has estimated removals and/or increases due to the proposed ELG: ethylene glycol, propylene glycol, potassium acetate, and ammonia. In fact, many of the airports that EPA believes discharge significant quantities of ADF discharge to saltwater rather than fresh water, and the freshwater toxicity weighting factors for the glycols are far higher than the saltwater factors. If we were to perform a more accurate toxicity cost-effectiveness analysis that reflects the actual fresh vs. saltwater nature of the receiving waters for each airport, the ADF provisions would be shown to abate far fewer TWPE than under our simplified analysis, and the ADF provisions would appear even more cost-ineffective than they do given our freshwater-only assumptions. For the pavement calculations, the opposite is true. The toxicity weighting factor for ammonia (from urea used for pavement deicing) is much higher for salt water than for fresh water, and a significant fraction of pavement urea usage occurs at airports discharging to salt water. A more accurate cost-effectiveness analysis that reflects the nature of the receiving waters would show better cost-effectiveness figures for the pavement provisions than what we show in the table above.

4. The Proposed Airport Deicing ELG Is Also Not Cost-Reasonable for Conventional Pollutants.

The proposed BAT requirements applicable to aircraft deicing would abate conventional pollutants, including oxygen demand (BOD₅), at a cost per pound of \$3.82.¹¹⁴ This substantially exceeds the figure of \$0.86 per pound (in 2006 dollars) for the POTW benchmark portion of the BCT cost test, a figure that is not to be exceeded when considering all conventional pollutants to be controlled by an ELG. The proposed Airport Deicing ELG is not cost-reasonable for controlling conventional pollutants, including oxygen-demand.

Table 15.
Cost-Effectiveness for Conventional Pollutants

	Cost (million 2006\$)	Removals (million lbs BOD ₅)	Cost per lb Conventional Pollutants
ADF provisions	\$87.50	16.3	\$5.37
Pavement provisions	\$3.80	7.6	\$0.50
Entire proposed rule	\$91.30	23.9	\$3.82

Compare against \$0.86/lb (in 2006 \$), POTW Test part of BCT cost test

Note that the pavement provisions of the proposed ELG do appear cost-reasonable relative to the benchmark figure for conventional pollutants – the pavement provisions would abate BOD₅ associated with urea discharge (partly offset by an increase in BOD₅ when urea is replaced with potassium acetate as a pavement deicer) at a net cost per pound of \$0.50, a figure somewhat lower than the benchmark for acceptability at \$0.86 per pound. However, this pavement analysis reveals that the ADF provisions, analyzed on their own, are even more cost-ineffective for controlling conventional pollutants than they appear when EPA analyzes the Proposed Rule as a whole.

We have presumed that a regulation achieving removals of COD, a nonconventional pollutant, should be evaluated relative to a cost-effectiveness benchmark that is legally applicable to BOD₅ and other conventional pollutants. We do this intentionally. COD and BOD₅ are both measures of the oxygen demand that an effluent will exert in receiving waters, with the two measures differing in the "type" of oxygen demanding chemicals that are being assessed, but the final measure is still oxygen demand over a length of time appropriate for that analytical method. EPA assumes, however, that the relationship between the two measures is constant across all airport deicing effluents; that the chemical oxygen demand that an effluent will exert in receiving

¹¹⁴ Our cost-effectiveness analysis for conventional pollutants converts EPA's estimates of load reductions for COD and ammonia into equivalent reductions in BOD₅, using EPA's estimate that there is an average of 1.67 lbs of COD per pound of BOD₅ for airport deicing chemicals. See the spreadsheet detailing these calculations in Appendix F. EPA has not estimated that the proposed ELG requirements will abate any meaningful quantity of additional conventional pollutants beyond BOD₅, such as perhaps TSS or oil and grease.

waters is always 1.67 times the BOD₅ that the effluent will exert.¹¹⁵ EPA's assumption regarding a constant relationship further supports the interchangeable nature of COD and BOD₅ measurements, and the applicability of our cost-reasonable comparisons.

Although the two measurements are different and reflect somewhat differing characteristics of the oxygen demand that an effluent will exert, one measure is essentially a scalar multiple of the other. In terms of cost-effectiveness benchmarks then, any existing benchmark for one of these measures of oxygen demand can be converted into a benchmark for the other measure of oxygen demand by applying this scalar constant. The existing cost-reasonableness benchmark for conventional pollutants (including oxygen demand) for BOD₅ (should not exceed \$0.86 per pound) can be converted to a benchmark for COD by dividing by 1.67, the assumed constant scalar ratio of COD to BOD₅ in airport deicing effluents. Thus, if there are 1.67 pounds of COD per pound of BOD₅ and an ELG option is unacceptable if it abates BOD₅ at a cost per pound exceeding \$0.86, then the option is equally unacceptable (not cost-reasonable) if EPA's proposal would abate COD at a cost per pound exceeding \$0.51 (\$0.86 divided by the 1.67 scalar).

If an ELG is not cost-reasonable for BOD₅ at a cost exceeding \$0.86 per pound, then it should similarly not be acceptable at a cost of more than \$0.51 per pound for COD. It should not matter how EPA chooses to measure the overall oxygen demand – as BOD₅, COD, BOD₇, ultimate BOD, carbonaceous BOD, or in any other laboratory analysis method for essentially the same oxygen demand of pollutants discharged – the cost-reasonableness requirement that must be met should remain functionally unaffected. The number for the benchmark will change as a function of how it is measured, but the effective level of the benchmark and, more importantly, the underlying policy for establishing the benchmark to begin with, does not change.

Note also that we are applying the POTW test portion of the BCT cost test as if it were a benchmark that applies for the entire quantity of pollutants controlled by a proposed regulatory option. Another interpretation of the BCT cost test focuses only on the incremental regulatory benefit associated with moving from BPT technologies to BCT technologies. Hence, EPA might assert that there is no benchmark applicable to the increment from baseline waste load to BPT, nor from baseline to BCT, where BCT is more stringent than BPT. We disagree. The BCT cost test analysis – based on the premise that no ELG focusing on conventional pollutants should cost more than \$0.86 per pound of all conventional pollutants, including BOD₅, – should be used as the general benchmark for the any applicable technology standard, as well as for any increment of more advanced controls from more advanced technologies (*i.e.*, from BPT to BCT). If the BCT increment is not supposed to cost any more than \$0.86 per pound of conventional pollutants removed, then the prior increment from baseline to BPT certainly should not cost more than \$0.86 per pound either. Certainly Congress did not intend a situation where the cost-reasonableness requirement for the BCT increment would be less stringent than that for the BPT increment.

Hence, if a BCT increment is acceptable even when it removes as little as 1.16 pounds of conventional pollutants per dollar of cost imposed (the inverse of \$0.86 in cost per pound removed), the BPT increment that precedes the BCT increment should be acceptable only if it abates even more than 1.16 pounds of conventional pollutants per dollar of cost imposed. After all, cost is supposed to be less important in relation to effluent reduction benefits when

¹¹⁵ See TDD at 10-19.

establishing an advanced level of control requirements (BCT) than it is when establishing a more basic level of control requirements (BPT). EPA's manipulation of the Airport Deicing ELG proposal to avoid the type of analysis mandated by Congress is a fundamental problem.

Furthermore, any argument regarding the relationship between a cost-effectiveness benchmark for an advanced increment of conventional pollutant control (from BPT to BCT) relative to the potential benchmark for a less advanced increment of conventional pollutant control (from current to BPT) is rendered moot by EPA's failure in the Proposed Rule to consider or propose any BPT at all. For the Airport Deicing ELG, EPA proposes options only for BAT (which for COD, we consider to be functionally equivalent to BCT for BOD₅). Absent any consideration or proposal of BPT, there is only one increment of control that the Agency is considering: from the current level of discharge of conventional pollutants, including oxygen demand, all the way to the proposed advanced level of control represented by BAT.¹¹⁶ The cost-effectiveness benchmark that applies generally to advanced controls for conventional pollutants, including oxygen demand, should apply as a minimum requirement regardless of how EPA defines the increment to advanced controls that is being considered.

The proposed regulation is not cost-effective in terms of controlling conventional pollutants, including oxygen demand. The cost per pound of conventional pollutants abated by the rule is four to five times higher than the maximum cost per pound at which controls may be required by an ELG for conventional pollutants.

5. The Proposed Airport Deicing ELG Also Is Not Cost-effective for Nutrients.

The proposed BAT requirements applicable to pavement deicers would abate nutrients (total nitrogen) at a cost per pound of \$23.82 in 2006 dollars. This far exceeds the several dollar cost per pound of nitrogen that EPA established as the cost-effectiveness benchmark for nitrogen nutrient control in the Meat and Poultry Products ELG promulgated in 2004.¹¹⁷ The following table shows the calculated cost effectiveness of the Proposed Rule in abating discharge of nutrients.

Table 16.
Cost-Effectiveness for Nutrients

	Cost (million 2006\$)	Removals (million lbs N)	Cost per lb Nutrients
ADF provisions	\$87.50	0	Infinite
Pavement provisions	\$3.80	3.8	\$0.99
Entire proposed rule	\$91.30	3.8	\$23.82

Compare against several \$/lb, perhaps up to \$10/lb, MPP ELG

¹¹⁶ The Air Transport Association comments analyze EPA's statutory requirement to develop BPT standards before promulgating BAT/BCT standards. ACI-NA agrees with ATA's legal conclusions. If EPA is obligated to promulgate BPT standards concurrently or prior to BAT/BCT standards, the issue raised here regarding incremental cost is moot. We would expect EPA to perform an appropriate cost-reasonableness analysis in any newly proposed BPT/BCT/BAT rulemaking for aircraft deicing.

¹¹⁷ The Economic and Environmental Benefits Analysis for the MPP ELG is not entirely clear about what the cost-effectiveness benchmark should be for nitrogen. It appears to be in the range of several dollars per pound of N abated, and perhaps up to as much as about \$10 per pound of N.

The ADF provisions of the proposed rule will not abate nutrient discharges because nutrients are not a component of ADF. EPA asserts that the pavement provisions of the Proposed Rule, however, will reduce the discharge of a significant quantity of urea and/or its decomposition product ammonia, and thus a significant quantity of nitrogen. The proposed pavement provisions appear cost-effective relative to EPA's benchmark for nutrient control.

6. In Sum, the Proposed ELG Is Not Cost-Effective for Any "Type" Of Pollutants.

The proposed Airport Deicing ELG is not cost-effective with respect to toxic pollutants, conventional pollutants (including oxygen demand, however measured), or nutrients. The Proposed Rule fails all possible cost-effectiveness tests. Note that in conducting our cost-effectiveness calculations and concluding that the proposed regulation costs more per pound abated than traditional benchmarks for toxic, conventional or nutrient pollutants, we have used EPA's estimates of pollutant removals (substantially overestimated) and the Agency's estimates of costs (substantially underestimated).

J. Legal and Other Issues

1. Aircraft Deicing Fluid Data and Terminology

EPA utilizes the term "Normalized ADF" to mean "ADF less any water added by the manufacturer or customer before ADF application." This term is inconsistent with the industry norm of "neat ADF" which refers to as-purchased ADF concentrate, which may contain up to 11% water. Fluid manufacturer's Material Safety Data Sheets (MSDS) frequently provide a range of water and other constituents within their deicing and anti-icing products. This could lead to variability in determining applicability of regulatory requirements and demonstrating compliance with the Proposed Rule. EPA must provide a better definition for normalized ADF.

In addition, EPA has proposed that the burden will rest with airports to obtain the glycol concentration minus water information from the manufacturer or air carrier. Airports will have to calculate pure freeze point depressant less water in ADF purchased and used by airlines and other entities deicing aircraft at their airport. In order to obtain this information, airports would require that airlines and FBOs regularly (daily, weekly, etc.) calculate and report data on type and quantity of ADF used. Given that airports are not the entity purchasing ADF, they have minimal leverage to obtain this information, let alone certify its accuracy. Nevertheless, EPA now proposes to create significant new obligations and legal liabilities on airports associated with activities and information over which they have little or no control. Therefore, EPA must provide a methodology for airline and airport reporting practices to ensure that regulators and the regulated community have a mutual understanding and confidence in the underlying data justifying this ELG proposal. EPA may consider developing a standardized reporting form or mechanism that airlines and other ADF users would be required to use and certify as accurate.

Perhaps EPA assumes too much by not considering alternatives to its universal belief that airport authorities are always the appropriate target for obtaining NPDES permits for aircraft deicing operations. In fact, many airports across the country have airline partners as co-permittees on their NPDES stormwater permits. EPA must also realize that airports do not

always permit every industrial operation that occurs at an airport. The industry's standard practice is for an "aviation fuel system consortium" to obtain its own permit for fuel farms, fueling operations, etc. Airports are not co-permittees in those instances. In addition, many airports require airlines to separately permit their large hanger operations.

The key issue here is that EPA's Proposed Rule presumes that the airport will obtain NPDES permits for the airline's deicing operations. The increased liability and cost EPA is proposing to impose on airports may alter airports' roles in how aircraft deicing is permitted. More than one airport has indicated that, based on the small and infrequent use of ADF by the tenant airlines, they either will forbid future deicing (cannot fly if deicing is needed) or will force airlines to separately permit their operations. EPA has not even considered this issue in its Proposed Rule. How EPA addresses the "information collection" difficulties being expressed in this section of comments may well dictate how airports approach permitting decisions.

Finally, EPA should clarify that "annual" ADF usage is based on deicing season, not calendar year.

2. Permit Writer Discretion

EPA recognizes that it has diverted from the historic ELG-type approach in its proposed Airport Deicing ELGs. It states:

EPA is aware that the ADF collection requirement differs from traditional end-of-pipe effluent limitations with regard to a mechanism for demonstrating compliance.¹¹⁸

The Agency then describes three procedures for demonstrating compliance with the proposed ADF collection standards. EPA implies that it is providing flexibility to airports by providing the three options, however, in fact the Agency is merely outlining the tools available to itself and other authorized permitting authorities to impose on airports a compliance methodology of their choosing. The end result is a compliance scheme that guts some of the core principles of the ELG program and renders airports to be mere pawns of the NPDES permitting program, potentially stuck flip-flopping back and forth to accommodate various permit writers on five-year permitting cycles. This result is unworkable for airports and an inappropriate regulatory scheme.

CWA Section 304(b) sets forth the process and parameters EPA must consider and follow in developing effluent limitations guidelines.¹¹⁹ In essence, CWA Section 304(b) requires EPA to identify the amount of effluent reduction attainable through the use of best practicable, best conventional, and best available technologies, and to "specify factors to be taken into account" in determining pollution control methods that are to be applied to point sources within certain classes or categories.¹²⁰ These guidelines then direct permitting authorities with regard to effluent limitations to be included in NPDES permits pursuant to CWA Sections 301 and 402. After its assessment of the legislative history of CWA Section 304(b), the Supreme Court found that Congress intended EPA to not only assess the effectiveness of various pollution control

¹¹⁸ 74 Fed. Reg. at 44,701.

¹¹⁹ 33 USC § 1314(b).

¹²⁰ *Id.*

methods, but also to “describe the methodology EPA intended to use in the [Section] 301 regulations to determine the effluent limitations for particular plants.”¹²¹

In developing these ELGs, EPA states that it identifies “the best available technology that is economically achievable for that industry and sets regulatory requirements based on the performance of that technology.”¹²² EPA further recognizes that the “effluent guidelines do not require facilities to install the particular technology identified by EPA; however, the regulations do require facilities to achieve the regulatory standards which were developed based on a particular model technology.”¹²³

EPA’s proposed Airport Deicing ELGs set forth ADF collection standards for two “model” technologies – centralized deicing pads and glycol recovery vehicles (GRVs) – with collection standards of 60 and 20 percent, respectively.¹²⁴ With regard to pads, EPA then sets forth seven minimum criteria for operating pads in order to ensure compliance.¹²⁵ EPA also sets forth two alternative methods for demonstrating compliance with the 60 percent collection standard; permitting authorities can identify alternate technologies that achieve the standard, or permitting authorities can set forth a monitoring scheme that demonstrates the appropriate percent capture of ADF.¹²⁶

However, contrary to EPA’s statement that facilities will not be forced to install EPA’s model technology, in fact EPA (in states in which it remains the permitting authority) and EPA-authorized state permitting entities must decide for the airport which of the three options the airport must employ. The airport’s only recourse, based on the language contained in the proposed Airport Deicing ELG, would be to bring a legal challenge to a permitting authority’s final issuing of the airport’s NPDES permit. Airports subject to the 60 percent collection standard have no part of the decision-making process for determining how they will comply with the collection standard. The same basic scheme applies to GRVs and EPA’s proposed 20 percent capture standard.

EPA’s proposed collection compliance scheme not only conflicts directly with its stated premise that regulated entities not be forced to use EPA’s model technology, but it also runs counter to the legislative history and conclusions of the Supreme Court in *Train*.¹²⁷ That Court found CWA Section 304(b) did more than “merely guide” permitting authorities, but rather more precisely described a methodology for implementing effluent limitations. The Court found that Congress intended for EPA to consider a variety of factors in setting the ELG standards pursuant to CWA Section 304 so that permitting authorities would not have to reconsider those factors but rather rely on “presumptively applicable” effluent limitations for each facility in the ELG category.¹²⁸

¹²¹ See *E.I. du Pont de Nemours v. Train*, 430 U.S. 112, 130 (1977).

¹²² See Effluent Limitations Guidelines Frequent Questions at <http://www.epa.gov/guide/questions>.

¹²³ *Id.*

¹²⁴ See Proposed 40 CFR § 449.10(a).

¹²⁵ See proposed 40 CFR § 449.20(b)(1)(ii).

¹²⁶ *Id.*

¹²⁷ 430 U.S. 112, 129 (1977).

¹²⁸ *Id.* See also U.S. EPA NPDES Permit Writers’ Manual at 56 (“Once the appropriate ELGs have been identified, application of the limitations is relatively straightforward since it involves the application of a guideline that has already been technically derived.”).

Hence, while EPA is within its authority to set a particular collection standard,¹²⁹ it has exceeded its authority by on the one hand prescribing precise technologies that are intended (but not guaranteed) to achieve that standard, and on the other hand deferring to permitting authorities to either accept that standard or devise one of two open-ended alternate methodologies on their own. In either case, the airport has no input into that process and the end result is a situation that runs counter to the legislative history, Supreme Court findings, and prior ELG rulemakings. Further, EPA's deference to permitting authorities to decide an appropriate compliance mechanism more closely resembles how effluent standards are derived in the absence of ELGs, through a standard setting process referred to as Best Professional Judgment (BPJ).¹³⁰ Congress intended EPA to develop ELGs on a category-by-category basis to replace BPJ in as many permitting situations as possible to create a more consistent permitting scheme.

By deferring to permitting authorities the power to dictate how airports will have to comply with the various collection standards, EPA has created additional challenges for assessing (and commenting on) the potential impacts of the proposed regulation on the industry. While EPA can calculate appropriate percent reductions to determine estimated benefits to the environment – which ACI-NA asserts must be recalculated with more accurate data – the Agency cannot accurately assess the cost impact on the industry for achieving those benefits. This is particularly true when EPA itself cannot currently predict how permitting authorities will impose compliance programs on airports that may (and will) differ from EPA's CDP and GRV based options. There may be significantly different cost factors associated with mandating 100 throughput for CDPs or implementation of GRVs in contrast to some alternative monitoring scheme that might demonstrate comparable collection through some alternative means. Assuming that to be true, EPA cannot predict how permitting authorities might mandate CDP or GRV usage in contrast to more efficient methods. One could argue that such an analysis would entail significant guesswork and would be arbitrary at best.

In fairness to EPA, the proposed Airport Deicing ELG contains a separate mandate in which the Agency has provided the permittee with a choice with regard to complying with airfield deicing mandates. There, the permittee can choose between certifying that it does not use urea or it must meet a numeric effluent limit for ammonia discharges. We point out this fact not in support of EPA's airfield deicing conditions but rather to demonstrate a more typical ELG approach to controlling pollutant discharges.

In sum, EPA's proposed collection standards compliance scheme is unpredictable and arbitrary. Setting a collection standard may be consistent with the ELG program, but mandating a model technology on the one hand, or delegating to the permitting authorities the obligation to derive comparable compliance technologies on the other, is not consistent with the CWA.

¹²⁹ See section II.D for comments on EPA's proposed collection standards.

¹³⁰ 33 USC § 1314(b).

3. The Proposed Rule Does Not Adequately Encourage Pollution Prevention Practices.

EPA's Proposed Rule is flawed because it fails to account for pollution prevention. The industry is actively engaged in a wide variety of pollution prevention practices and research, particularly relating to ADF formulations and application. EPA recognizes this fact, but fails to embrace or address it within its proposed standards.

EPA asserts part of its legal authority for the proposed rule is the Pollution Prevention Act of 1990 ("PPA"), 42 USC §§ 13101 *et seq.*¹³¹ The Agency then reviews industry pollution prevention practices, such as infrared deicing systems, forced air/hot air deicing systems, product substitution, etc.¹³² However, EPA offers no benefits or encouragement for undertaking pollution prevention activities within its proposed ADF collection standards. While EPA may be unsure about determining how a credit system would work within its proposal, the net result is contrary to the PPA and EPA's past ELG rulemakings. Consistent with past precedent, EPA should propose a best management alternative to any numeric standard to allow for progressive pollution prevention activities at airports.

Currently, airports are already becoming leaders with regard to pollution prevention, sustainability, green building and other emerging environmental technologies/procedures. EPA's proposed rule is noticeably contrary to that trend. EPA must revisit these issues to address the serious flaws in its proposal that inhibit pollution prevention practices.

The PPA directs EPA to, among other things, "review regulations of the Agency prior and subsequent to their proposal to determine their effect on source reduction."¹³³ This directive is aimed at achieving the goals of the PPA, which "declares it to be the national policy of the United States that pollution should be prevented or reduced whenever feasible; pollution that cannot be prevented should be recycled in an environmentally safe manner, whenever feasible; pollution that cannot be prevented or recycled should be treated in an environmentally safe manner, whenever feasible; and disposal or release into the environment should be employed only as a last resort...."¹³⁴

In its prior Pesticide Chemicals Category, Formulating, Packaging and Repackaging ELG,¹³⁵ EPA summarized this mandate by stating, "[i]n short, preventing pollution before it is created is preferable to trying to manage, treat or dispose of it after it is created."¹³⁶ The Agency recognized that Congress enacted the PPA 18 years after enacting the core elements of the Clean Water Act. Thus, Congress must have intended that the pollution prevention policy work in conjunction with the Clean Water Act's preexisting mandates. Within the PPA hierarchy, EPA reasonably determined that the Pesticide ELG should be promulgated to promote pollution prevention and source reduction in lieu of treatment (and related numeric limits associated with

¹³¹ 74 Fed. Reg. at 44,677.

¹³² *Id.* at 44,688 and EPA's TDD at Chapters 5 and 8.

¹³³ 42 U.S.C. § 13103(b)(2).

¹³⁴ *Id.* at § 13101(b).

¹³⁵ 40 CFR Part 455.

¹³⁶ 61 *Federal Register* 57,518, 57,520 (Nov. 6, 1996).

treatment). EPA justified its reliance on the alternative BMP approaches in the Pesticide Chemicals Category, Formulating, Packaging and Repackaging ELG, in part, due to the Congressional mandates contained in the PPA.¹³⁷

In fact, EPA's Pesticide ELG is a good example for how EPA could approach a future Airport Deicing ELG by providing alternatives between model treatment effluent limits and model BMP technologies without limits. The Pesticide ELG provides regulated entities with a choice between zero discharge and pollution prevention alternatives. EPA relied on that single technology approach to satisfy the BPT, BCT, BAT, NSPS, PSES and PSNS standards. In fact, both the zero discharge and pollution prevention options are BMP-based. The pollution prevention alternative allows non-numerically limited wastewater discharges provided that pollution prevention BMPs are implemented at the facility.

EPA has promulgated a number of other BMP-based ELGs. For example, EPA specifically set forth BMPs as the best available technology (BAT) ELG standards for the Concentrated Aquatic Animal Production (CAAP) point source category. Specifically, "flow-through and recirculating" aquatic animal production facilities are required to:

- 1) notify the permitting authority of the use of any investigational new animal drug and any extralabel drug use where the use may lead to a discharge to waters of the U.S.;
- 2) follow general reporting requirements for failure in or damage to the structure of an aquatic animal containment system resulting in an unanticipated material discharge to waters of the U.S.; and
- 3) develop and maintain a BMP plan on site describing management of solids control, material storage, structural maintenance, record-keeping and training.¹³⁸

"Net pen" facilities have similar requirements, but the BMP plans target controlling feed management, waste collection and control, transport or harvest discharge, carcass removal, material storage, maintenance, record-keeping and training.¹³⁹

Similarly, the Western Alkaline Coal Mining (Subpart H) subcategory of the Coal Mining ELGs only requires BMP implementation and development of a Sediment Control Plan to meet the CWA's BPT, BAT, and NSPS standards. More specifically, the ELG requires the operator of a facility to:

- 1) submit a site-specific Sediment Control Plan designed to prevent an increase in average annual sediment yield from pre-mined, undisturbed conditions;
- 2) gain approval of the Sediment Control Plan from the permitting authority and incorporate it into the permit as an effluent limitation;

¹³⁷ 42 U.S.C. §§ 13101 et. seq.

¹³⁸ 40 CFR § 451.12.

¹³⁹ *Id.*

- 3) identify BMPs in the Sediment Control Plan and describe design specifications, construction specifications, maintenance schedules, criteria for inspection, and expected longevity/performance for the BMPs;
- 4) demonstrate with modeling that implementing the Sediment Control Plan will result in average annual sediment yields that will not exceed sediment yield levels from pre-mined, undisturbed conditions; and
- 5) design, implement and maintain BMPs in the manner specified in the Sediment Control Plan.¹⁴⁰

EPA's Transportation Equipment Cleaning ELG afforded the regulated tank truck facility operators with a choice between meeting numeric effluent limitations or implementing a BMP-based pollutant management plan.¹⁴¹ In sum, EPA has numerous precedents in which it applied BMPs in lieu of numeric limits in its ELG rulemakings.

4. Environmental and Other Impacts

EPA has not adequately accounted for the other impacts that will be created or exacerbated through implementation of the Proposed Rule, including other environmental impacts. These include the effects of adding impervious surface within the airport property, creating wildlife attractants through increased on-site storage, and increased carbon dioxide emissions from aircraft, GRVs, other vehicles, energy usage, and required treatment systems.

a. Wildlife Attractants Must Be Minimized

Ensuring safe aircraft operations is a critical issue for U.S. airports. As shown by last year's events associated with the US Airways Flight 1549 landing in the Hudson River after a double-engine ingestion of Canada geese, wildlife can present dangerous risks to aviation. Airports work aggressively to mitigate those risks through multi-faceted approaches specific to the wildlife issues of each specific airport. One universal approach includes minimizing wildlife attractants on or near airport property. The stormwater storage needs associated with the proposed collection and treatment requirements create a potentially hazardous wildlife attractant at airports.

FAA Advisory Circular 150/5200-33B, *Hazardous Wildlife Attractants on or Near Airports*, identifies water management facilities such as stormwater retention and settling ponds as activities that can attract large numbers of potentially hazardous wildlife. FAA provides specific requirements and recommendations for airports to adhere to in order to minimize the wildlife hazards associated with such stormwater facilities. These include a maximum detention period of 48 hours where possible, lining to prevent vegetation that provides nesting habitat, and physical barriers (which require FAA approval) to deter hazardous wildlife. These recommendations also extend to off-airport facilities. The additional stormwater storage that will be required under the Proposed Rule may create problematic wildlife attractant issues.

¹⁴⁰ 40 CFR §§ 434.82 – 434.84.

¹⁴¹ See 40 CFR Part 442.

b. Increased Greenhouse Gas (GHG) Emissions Must Be Accounted For.

Because EPA has not properly accounted for the potentially significant operational impacts that may result from implementation of the Proposed Rule, the basic analysis EPA conducted to determine the increased emissions associated with aircraft taxiing and queuing is inadequate.

In the draft ELG rule, EPA recommends on-site anaerobic (biological) treatment of deicing fluids, which will result in the production of methane and nitrous oxide, both of which are greenhouse gases (GHGs). In addition to increasing GHG emissions when EPA is moving toward requirements to reduce GHG emissions, this technology may have regulatory and financial implications for an airport with regards to finalized and emerging GHG reporting regulations.

- 1) On-site biological treatment of deicing fluids that generates methane and nitrous oxide will likely be a regulated source of GHG emissions on state and federal level(s). In addition to the increase of the airport's overall GHG inventory, it may also cause an airport to surpass existing and emerging reporting thresholds or emerging reduction thresholds, and thus introduce an additional environmental compliance issue. This may also have financial implications for an airport.
- 2) Within EPA's finalized GHG Reporting Rule (September 2009), the GHG source category of "industrial wastewater treatment", under which treatment of deicing fluids would likely fall, was not included as a "trigger category" in the final rule due to time constraints. However, EPA stated that they intend to include this category in the first revision of the rule in 2010. As a result, any airport that has on-site biological wastewater treatment processes would have to model its GHG emission rates to determine whether or not it would be over the reporting threshold of 25,000 metric tons CO₂e (EPA's final report rule) or the reporting threshold of the draft congressional GHG legislation. If so, or if the wastewater treatment process was at an airport that had other GHG sources over the reporting threshold, then the airport would be required to monitor wastewater flows and treatment parameters, and calculate and report estimated GHG emissions from these processes annually. This could also have financial implications for an airport.

5. Compliance with Proposed BAT Standards is Impossible for Many Airports within the Statutory Timeframe.

Clean Water Act Section 301(b)(3)(B) mandates that ELG standards, once incorporated into a facility's NPDES permit, must be complied with, "as expeditiously as practicable but in no case later than three years after the date such limitations are established..."¹⁴² Permitting authorities must incorporate ELG standards, once promulgated by EPA, into NPDES permits as effluent

¹⁴² 33 USC § 1311(b)(3)(B).

limitations.¹⁴³ Hence, once EPA promulgates ELG standards, the permitting authorities must include the standards in all subsequent rounds of NPDES permit. If a facility seeks a new or reissued permit immediately following EPA's promulgation of ELG standards, the permitting authority must implement those standards immediately. In theory, the longest a target facility could go without the ELG standards being implemented into their permit would be five years (which assumes that that facility obtained a new five year NPDES permit immediately prior to EPA promulgating new ELG standards. However, such a scenario is unlikely because most NPDES permits contain reopener clauses that allow permitting authorities to modify existing permits when new ELG standards have been promulgated.¹⁴⁴

The CWA three year compliance deadline once the ELG standards are implemented into a NPDES permit is absolute. EPA's *NPDES Permit Writers' Manual* states the following:

When applying applicable ELGs in permits, permit writers need to be aware that they do not have the authority to extend statutory deadlines in a NPDES permit; thus, all applicable technology-based requirements (i.e. ELGs and BPJ) must be applied in NPDES permits without the benefit of a compliance schedule.¹⁴⁵

EPA's proposed Airport Deicing ELG rule would force certain airports to construct centralized deicing pads. Even for airports that could be provided the longest theoretical statutory compliance period – eight years, or five years to obtain a reissued NPDES permit followed by the three year statutory period – most if not all could not design, finance, and construct pads within that timeframe, particularly land constrained airports. The Port Authority of New York and New Jersey, for example, reports that it would take the Authority 10 years or more to install centralized deicing pads at one of its airports potentially subject to the 60 percent collection standard, assuming that such a project is even possible.

The “compliance impossibility” EPA has set up through its proposed Airport Deicing ELG is a clear demonstration that EPA's proposal is legally conflicting, arbitrary and capricious.

III. CONCLUSION

ACI-NA appreciates the opportunity to comment on EPA's Proposed Rule. We hope to meet with EPA staff soon to discuss these comments, answer questions, and consider ways in which we can work together to identify ways to improve the current NPDES permit program's existing controls of deicing stormwater discharges.

¹⁴³ See 40 CFR 122.43-44.

¹⁴⁴ *Id.*

¹⁴⁵ *NPDES Permit Writers' Manual* at 5.1.1. http://cfpub.epa.gov/npdes/writermanual.cfm?program_id=45

**Effluent Limitation Guidelines and Standards for
the Airport Deicing Point Source Category;
Proposed Rule**

**Advice and Recommendations of the
Airports Council International-North America**

Appendices

February 26, 2010

**APPENDIX A..... Cleveland Hopkins International Airport 2009-2010 Local Airport
Deicing Plan**

**APPENDIX B..... Cleveland Hopkins International Airport 2009-2010 Aircraft Anti-
icing / De-icing and Discharge Management Plan**

**APPENDIX C..... Aircraft Deicing Fluid Usage: ACRP ADF Usage v. EPA ADF Usage
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**APPENDIX D..... Photographic Evidence of Limited Deicing Fluid Available for
Collection Following Defrosting**

APPENDIX E..... Operational Cost Calculations

APPENDIX F..... Cost Effectiveness Calculations

APPENDIX A

Cleveland Hopkins International Airport 2009-2010 Local Airport Deicing Plan

Cleveland Hopkins International Airport's Local Airport Deicing Plan (LAPD) explains the airport's strategies for minimizing the amount of time an aircraft spends on the ground following deicing. The LADP also sets out the roles of the Deicing Committee (deciding matters related to the airport's centralized deicing facility) and the Snow Desk (planning and executing the LADP and triggering implementation of the airport's departure allocation program). Both groups include representatives from the airport, airlines, air traffic control, and the centralized deicing facility operator.

Cleveland Hopkins International Airport

Local Airport Deicing Plan

2009 – 2010

This document has been created to establish the Cleveland Hopkins International Airport (CLE) local airport deicing plan (LADP) as required by FAA order 7210.3. It defines local strategies that minimize the amount of time an aircraft spends on the ground after an aircraft has been deiced / anti-iced.

A central component of the plan is a fair, equitable and unbiased procedure for allocating departures when demand exceeds capacity. The users at CLE have selected option C under the above order that states: Airport users determine the departure allocation. Air Traffic (AT) will notify the users of the departure rate in effect and the users will then advise air traffic which flights they will use in their allocation. Air traffic will provide input on the coordination process but will not accept an active role in the departure allocation.

With the implementation of a Centralized Deicing Facility (CDF) at CLE, a departure allocation program (DAP), satisfying option C will be administered and communicated by the pad operator, AeroMag, on behalf of the airline user group.

Two mechanisms have been initiated to address coordination, communication and overall efficiency of the plan consisting of a Deicing Committee and a Snow Desk. The Deicing Committee consists of representation from airline users, the airport operator, the centralized deicing facility operator, and local air traffic control. The committee shall have authority to decide all matters related to the CDF and make recommendations as it sees fit.

The Snow Desk is the primary planning and execution component of the local airport deicing plan; consisting of representatives from the hub carrier, Airport Operations, Air Traffic Control, the CDF operator, and a rotating airline representative. The Snow Desk will serve as the triggering mechanism for the implementation of the departure allocation program.

Additionally, this plan will contain details of the Aircraft Inspection Program implemented in response to FAA notice N8900.55. This notice provides guidance and procedures for dispatching during Ice Pellet and in Heavy Snow Conditions and evaluating pilot assessment of precipitation intensity.

Snow Desk

The Snow Desk will conduct daily strategic and tactical conference calls, using an open bridge line, with scheduled times of 0630, 1430, and 2100, or at intervals determined on the scheduled calls, in response to severe or extreme weather and storm events. Bridge lines will be limited to a single user for AeroMag and OA Carrier representative, and two lines each for CLE Airport Operations and the CLE FAA ATCT. Continental Airlines, as the hub carrier, will be allocated up to four participant lines. The Snow Desk will have the collaborative authority to trigger the departure allocation program when traffic demand is forecasted to exceed capacity under a number of severe weather or operational scenarios. The daily calls will begin each winter season on November 15th and will continue through April 1st of the succeeding year.

[Bridge Line — 1-877-324-8000; Participant Code — 15997#]

Scheduled times 0630, 1430, & 2100.

Contributing factors such as weather conditions, runway configuration, acceptance rates, snow removal, taxi times and CDF throughput capacity will be considered in addition to the airport demand when activating the DAP.

The call must follow a disciplined script in the order below, and the following agencies will be expected to provide the detailed baseline information when participating on the calls:

- Air Traffic
 - Current and expected AAR/ADR
 - Runway configurations and taxi routes
 - Anticipated runway changes
 - Traffic initiatives
 - Arrival demands – TSD projection
 - Confirmation of Frost Control operation
 - Navigational aid status (include glideslope/localizer outages from snow depth)
- CLE Airport Operations
 - Current weather forecast (NWS/Meteorlogix/other sources)
 - Current field condition status for runways, taxiways, and ramps
 - Snow removal plan, including circuit routes and chemical treatments
 - Staffing and equipment status including runway, taxiway, CDF, and ramp crews
 - Anticipated runway closure times

Cleveland Hopkins International Airport Local Airport Deicing Plan

- Runway signage and marking status (treatment plan for obscurations)
- AeroMag
 - Pad-1 and Pad-2 Active Status
 - Throughput capacity, current and forecasted
 - Traffic demand forecast
 - Staffing and equipment status
 - Type I and Type IV Fluid levels – on hand /capacity and order/delivery status
 - DAP activation potential and readiness
 - Snow removal issues
 - Anticipated deicing times based on current and forecast conditions
- Hub Carrier
 - Flight schedule reductions (current / future)
 - Delay status
 - Review of weather provided by internal sources
 - Aircraft inspection status
- User Group
 - Flight schedule reductions (current / future)
 - Delay status
 - Review of weather provided by internal sources

If any of the following situations are occurring or anticipated to occur, an immediate call is to be initiated: heavy snow or freezing rain, change in AAR / ADR, immediate runway closure required, runway closure times extended beyond plan, CDF throughput capacity reduction, or navigational aid outage or loss.

Departure Allocation Program

Upon determination by the Snow Desk participants that the DAP will be activated, CLE Airport Operations will advise all Air Carrier Operations via the network group call system, and AeroMag will broadcast notifications using the SITA telex network to pre-assigned addresses.

The CDF operator, AeroMag will have the sole responsibility to administer the DAP, inclusive of all communication, planning and coordination duties and the ultimate successful execution of the program. Specific responsibilities for AeroMag and all other entities during a DAP implementation will be further detailed in this document.

Cleveland Hopkins International Airport Local Airport Deicing Plan

The essential objective of the DAP will be to balance the departure traffic when demand has exceeded the airport capacity. This will be achieved through allocation of departure slots for all scheduled air carriers issued in 15-minute increments for each impacted hour at the CLE airport.

The methodology used to allocate departures will be based strictly on a carriers' total scheduled flight operations for each hourly period with percentage points rounded to the next highest or lowest whole number.

All scheduled air carriers and operators will be required to submit their future final schedules to AeroMag no later than 21 days prior to their implementation.

Flight diversions, additional flying and flights with unusual or critical circumstances will be allotted any open slots in planned order of departure. A hot list of flights that have not received a departure allocation will be kept active by AeroMag and accommodated after discussions with the Hub Carrier and airline user group representative on the Snow Desk.

The following operational procedures will be initiated for a DAP event:

- The CLE FAA Air Traffic Control Tower will determine and provide AeroMag and the Snow Desk the appropriate 15-minute departure rate based on operational factors as outlined above.
- AeroMag will confirm the rate for the specified period and provide a real time traffic demand status to the Snow Desk, for discussion on when to implement and terminate the DAP.
- AeroMag will then administer the allocation program using the predetermined methodology as outlined.
- AeroMag will be responsible to communicate to all airline users and operators their expected departure allocations in the specified 15-minute period of each hour.
- AeroMag will be required to monitor the actual departure counts being sent to the CDF when the DAP is active and will refuse entry to and return any unapproved departure flights.
- AeroMag is required to keep all aircraft clear of the OFA for all taxiways adjacent the CDF (as outlined in the CDF Aircraft Movement Plan).
- AeroMag will be required to continually monitor throughput times at each CDF bay during a DAP determining real time demand and the need for queuing.

Cleveland Hopkins International Airport Local Airport Deicing Plan

- AeroMag will then be required to communicate the need for queue requirements to CLE Airport Operations and all users immediately.
- AeroMag will be responsible to directly coordinate gate hold and queuing procedures during a DAP event in advance of any aircraft departing from the gate.
- Airline users at the A and B concourses have chosen as a general preference gate holds as the primary sequencing method during departure allocation events.

Specific responsibilities and procedures executed by additional entities during a DAP event include:

FAA CLE ATCT

- Validate the current departure rate every 30 minutes and advise the Snow Desk if there any changes.
- Provide notification to the Snow Desk of any anticipated changes in the departure rate.
- Notify the CLE ARTCC (ZOB) that Winter Operations are in effect and the LADP has been implemented.
- Coordinate directly with ZOB on flights affected by Traffic Management Initiatives, i.e. En route spacing, ground delay, and arrival spacing programs. Tower will contact ZOB for release times prior to deicing. Tower will contact ZOB if aircraft will not meet release time by plus or minus two minutes.
- Include the following like-message in the ATIS broadcast:
The CLE Departure Allocation Program is in effect. Flight crews should contact company operations for specific Departure Allocation Time information.

AIRLINE/OPERATOR

- Verify their real time flight activity with AeroMag prior and during the DAP.
- Once departure slot allocations have been distributed it is the responsibility of each carrier and operator to determine how their

Cleveland Hopkins International Airport Local Airport Deicing Plan

allocations will be used sending only their approved allotments to the CDF.

- Slots allocated in the 15-minute increments that cannot be used must be given immediately back to AeroMag for their rapid reallocation.
- Internal communications on the overall DAP will be the responsibility of each carrier and operator.
- Communication of actual departure allocation times to flights crews will be the responsibility of each carrier and operator.
- Aircraft under control of the Continental Ramp Tower shall advise CLE Ground Control on initial contact which CDF Pad (Pad-1 or Pad-2) they are assigned.

**Cleveland Hopkins International Airport
Local Airport Deicing Plan**

Table Insert to be provided
Issued monthly by AeroMag
CLE Flight Schedule Data

Cleveland Hopkins International Airport

2009 – 2010

Departure Allocation Program

**Hourly
Dept Rate**

**15-Minute
Allocations**

Airline Allocations

Deicing Committee

The Deicing Committee* shall consist of 10 total representatives comprised from the Air Carriers, the Operator, the City, and the local FAA. The specific breakdown of the committee is as follows; seven voting (7) Air Carrier representatives, one (1) non-voting CDF Operator representative, one (1) non-voting City/CHIA representative, and one (1) non-voting local FAA representative.

The voting and decision making authority of the committee shall follow the established MII (Majority in Interest) structure, whereby an issue, resolution, or vote shall pass upon:

1. Approval of 50% of scheduled airlines and 50% of landed weight, or
2. Approval of 40% of scheduled airlines and 70% of landed weight.

The Deicing Committee shall have the authority to decide all matters relating to the CDF operation as outlined in executed agreements including but not limited to: bay management; aircraft movement on the pads; deice staffing, equipment and glycol supplies; operational procedures for the pads; snow removal on the pads; and the administration of the departure allocation program.

The committee will meet regularly during the deicing season, in addition to meeting on an as-needed basis to review either pre-event readiness or post-event performance.

*Final Committee Composition to be affirmed through executed contracts/service agreements.

Aircraft Inspection Program

In October 2005, the FAA originally issued Notices 8000.309, Dispatching during Precipitation Conditions of Ice Pellets, Snow Pellets, or Other Icing Events for which No Hold Over Times Exist; and 8000.313 Parts 121 and 135 Operations Specifications for Deicing/Anti-icing Operations in Ice Pellets Without Deice/Anti-ice Fluids.

As a result of these notices, research was conducted in the winter seasons of 2005-06 and 2006-07, and the data obtained from this research sought to provide relief during ice pellet and heavy snow conditions.

Cleveland Hopkins International Airport Local Airport Deicing Plan

FAA Notice 8900.55 provides the latest guidance on operations in light ice pellets and heavy snow conditions. The order provides operators of approved deicing programs guidelines on extended allowance times for operations in light ice pellets, moderate ice pellets and light ice pellets mixed with other forms of precipitation.

In response to this notice, Continental Airlines will continue the secondary "Aircraft Inspection" units at CLE. This unit consists of Continental Airlines Chief Pilot leadership and select flight operations support personnel operating in a specially equipped with VHF radios (Freq 131.57) and approved light bars, positioned at the active departure runway ends (see Attachment-1). The Aircraft Inspection units will use the call sign "Snowflake" for radio communications with ATC and aircraft.

A complete visual inspection and, if practical, a tactile inspection of the aircraft will be conducted, and a determination will then be made to continue the aircraft takeoff or return the aircraft for secondary deicing.

The Aircraft Inspection unit will operate on a schedule dedicated to Continental Airlines and partner aircraft traffic banks and activity. The unit can conduct informational inspections of OA aircraft provided they are requested by the Pilot in Command (PIC) and can occur in conjunction with their repositioning for Continental and partner flight activity.

Reference to Airfield Map depicting Aircraft Inspection vehicle staging areas
(See Attachment-1)

- 24R Departures – Taxiway G between Taxiway G1 and Taxiway S
- 24L Departures – Taxiway J just north of Taxiway W
- 28 Departures – East end of Taxiway Y at the Runway 28 pad
- 10 Departures – UPS pad entrance, west of Taxiway B
- 6L Departures -- Taxiway G at intersection Taxiway T
- 6R Departures -- Taxiway T at intersection of Taxiway L

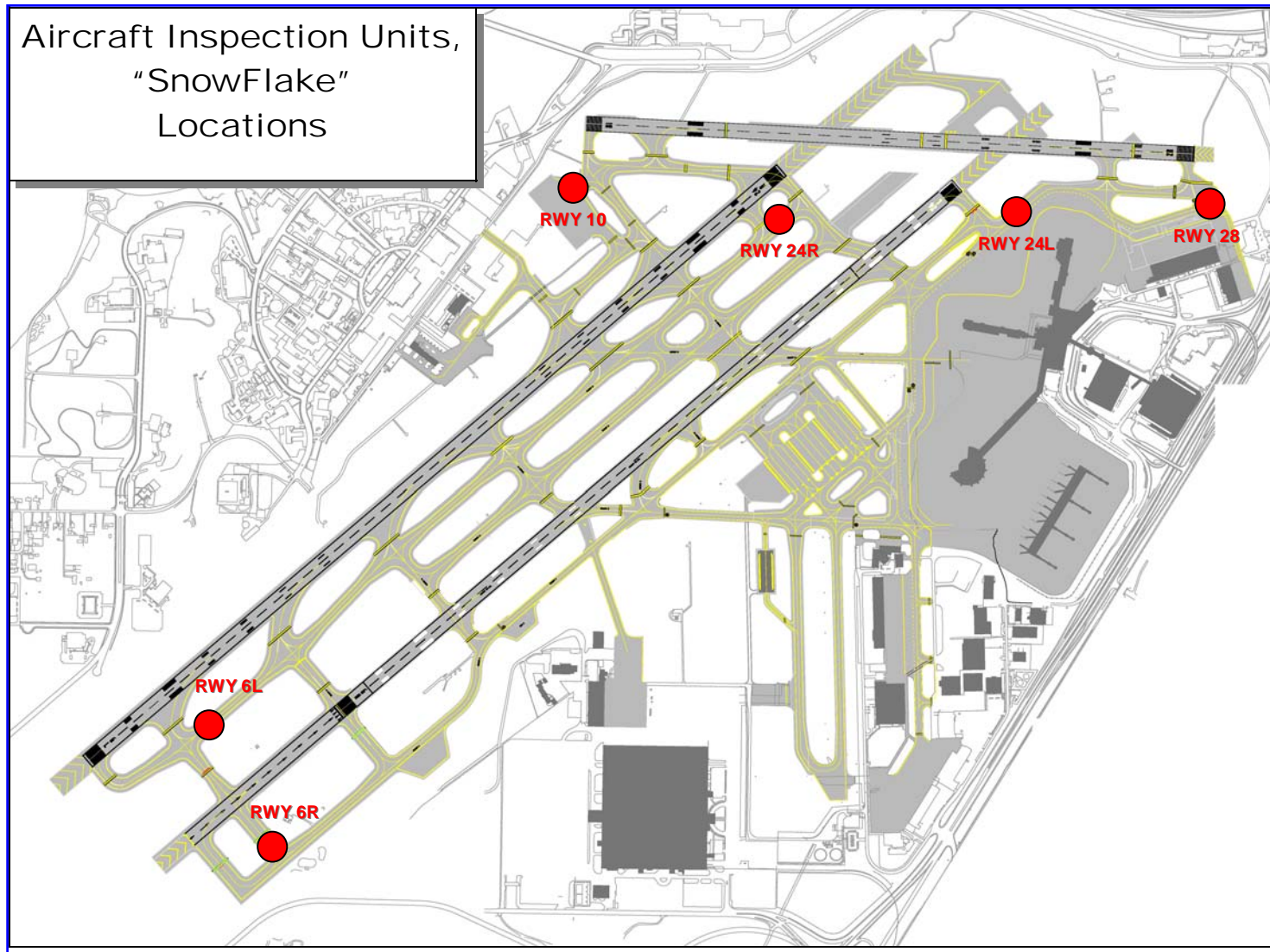
ACRONYMS

Air Traffic, Deicing, Operational Terms

AAR	Airport Arrival Rate
ADR	Airport Departure Rate
AI	Aircraft Inspection
APREQ	Approval Request
ARTCC	Air Route Traffic Control Center
ATCSSC	Air Traffic Control System Command Center
ATCT	Air Traffic Control Tower
ATIS	Automatic Terminal Information Service
CDF	Centralized Deicing Facility
CLE	Cleveland Hopkins International Airport
DAP	Departure Allocation Program
EDCT	Estimated Departure Clearance Time
ESP	Enroute Spacing Program
FAA ATCT	Federal Aviation Administration
LADP	Local Airport Deicing Plan
MII	Majority in Interest
MIT	Miles in Trail
NOTAM	Notice to Airmen
OFA	Object Free Area (Taxiway)
RVR	Runway Visual Range
RWY	Runway
TMU	Traffic Management Unit
TRACON	Terminal Radar Approach Control Facility
VHF	Very High Frequency
ZOB	Cleveland Air Route Traffic Control Center

Cleveland Hopkins International Airport
Local Airport Deicing Plan

Attachment-1



APPENDIX B

Cleveland Hopkins International Airport Aircraft Anti-icing / De-icing and Discharge Management Plan

Cleveland International Airport's 2009-2010 Aircraft Anti-icing / De-icing and Discharge Management Plan is included here as one example of a deicing management plan. CLE's Plan addresses the anti-icing and de-icing activities and operations that are conducted by the tenants, airlines and Fixed Based Operators (FBOs) at the airport. These activities include: Centralized Deicing Facility (CDF) and gate anti-icing and de-icing, fluid collection and discharge, enforcement program, safety program, chemicals approved for use, communication between tenants and DPC staff, and protocols to ensure all parties are informed to discuss CLE winter activities and changes within the industry.

The Plan is developed annually to implement Best Management Practices (BMPs). The Plan is also required under the Ohio EPA Modified Consent Order. The intent of the Plan is to ensure safe winter operations while being compliant with environmental permits through management of the collection of deicing fluid before, during, and after deicing events and routing of accumulated fluids to appropriate disposal facilities.

AIRCRAFT ANTI-ICING / DE-ICING AND DISCHARGE MANAGEMENT PLAN



2009-2010

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Acronyms of Basic Airport and Deicing Terms

AOA	Aircraft Operating Area
ATC	Air Traffic Control
BMP	Best Management Practice
CDF	Centralized Deicing Facility
CLE	Cleveland Hopkins International Airport
DPC	Department of Port Control
DWD	Dry Weather Deicing
FAA	Federal Aviation Administration
FBO	Fixed Based Operator
GRV	Glycol Recovery Vehicle
GSE	Ground Service Equipment
NEORSD	Northeast Ohio Regional Sewer District
NPDES	National Pollutant Discharge Elimination System
Ohio EPA	Ohio Environmental Protection Agency
PG	Propylene Glycol
RWY	Runway
SSSP	Significant Storm Surge Protection
TWY	Taxiway

Contacts

DPC Airport Operations	(216) 265-6090
DPC Environmental Services	(216) 857-6867 (cell)
	(216) 265-6615 (office)
AeroMag-2000 (AeroMag),	(216) 267-0011
Inland Waters of Ohio (IWO)	(216) 408-1315
Emergency Number for IWO	(800) 869-3949

1.0 INTRODUCTION

The City of Cleveland owns and operates, through the Department of Port Control (DPC), the Cleveland Hopkins International Airport (CLE) gateway to the Northeast Ohio Region. Pursuant to charter requirements, the DPC is tasked to promulgate rules and regulations that address good environmental stewardship of the Airport. This document addresses the management of aircraft deicing activities and the management of waste deicing fluids.

The Aircraft Anti-icing / De-icing and Discharge Management Plan (Plan) was formulated to implement Best Management Practices (BMPs). The intent is to ensure safe winter operations while being compliant with environmental permits. The objective is to manage the collection of deicing fluid before, during, and after deicing events, and to route accumulated fluids to appropriate disposal facilities.

The Plan addresses the anti-icing and de-icing activities and operations that are conducted by the tenants, airlines and Fixed Based Operators (FBOs) at CLE. These activities include: Centralized Deicing Facility (CDF) and gate anti-icing and de-icing, fluid collection and discharge, enforcement program, safety program, chemicals approved for use, communication between tenants and DPC staff, and protocols to ensure all parties are informed to discuss CLE winter activities and changes within the industry.

DPC and its tenants, airlines and FBOs are committed to managing aircraft anti-icing and de-icing chemicals in the most cost efficient and environmentally sound manner available. DPC goals are to meet Ohio Environmental Protection Agency (Ohio EPA) National Pollutant Discharge Elimination System (NPDES) permitting requirements, discharge collected fluids properly, and collect the spent deicing fluids with the highest concentrations achievable for recycling. The goals will be achieved by: having an accepted Plan, holding regular meetings with the airlines, tenants, and the various contractors and consultants involved in aircraft anti-icing and de-icing at CLE, monitoring CLE operations with adherence to the Enforcement Policy within this Plan, and monitoring outfall discharges as a result of anti-icing and de-icing activities. At the end of each

winter season, an end of the year summary report is prepared and kept on file in the DPC Environmental Services Office.

2.0 AIRCRAFT ANTI-ICING/DE-ICING OPERATIONS

General conditions for aircraft anti-icing/deicing operations at CLE are described in Section 2.1. This is followed by a detailed discussion of Standard Procedures in Section 2.2 and allowable Gate Procedures in Section 2.3. These procedures were developed in partnership with DPC tenants and airlines managers as well as the Federal Aviation Administration (FAA).

Aircraft Anti-icing / De-icing Activities are sub-divided into winter and summer (Dry Weather) seasons. Winter season activities (extending from approximately October 15 through April 15) must adhere to the approved deicing locations and methodologies outlined in Sections 2.1, 2.2, and 2.3 of this Plan. Summer (Dry Weather) season (extending from April 16 through October 14) shall follow the guidelines as outlined in Section 2.4 of this Plan.

The Centralized Deicing Facility (CDF) is illustrated in Figure 1. The Applicator/Operator will be a contractor to the airlines and will be responsible for applying the anti-icing and de-icing fluid to the aircraft. The Collection Contractor will be a contractor to DPC and will be responsible for spent fluid collection at all approved de-icing locations (Figure 2), recycling fluids as applicable, and appropriate discharge of non-recycled fluids to Northeast Ohio Regional Sewer District (NEORS).D).

- The Centralized Deicing Facility (CDF) consists of two pads identified as Pad-1 and Pad-2
- AeroMag-2000 (AeroMag),: the applicator/operator licensed to use the CDF for aircraft deicing activities
- Inland Waters of Ohio, Inc: the Collection Contractor

2.1 General Winter Season Protocol

The winter anti-icing / de-icing season extends from October 15 through April 15 of the following year. During the winter season the following general protocols will apply.

2.1.1 General Provisions

There will be no anti-icing / de-icing operations conducted over open drains, with the exception of those activities at the CDF where spent fluid is collected via the drainage system.

If fluid is discovered flowing toward unauthorized open drains, DPC Airport Operations must be contacted immediately at (216) 265-6090. Airport Operations will alert the Collection Contractor to assist in controlling fluid.

All efforts shall be made to remove snow prior to deicing activities.

All airlines/tenants shall make proper notification (Sections 2.2 and 2.3) when activating aircraft defrosting or de-icing activities. This notification will include the expected times of deicing, types and volumes of de-icing fluid, and any company/operation specific requests that may enhance the efficiencies of aircraft movement.

Tenants will record amounts and type of aircraft deicing fluid expended along with any relevant operational data (Section 7.0 and Attachment C) by 0800 hours the day following application use, via fax to DPC Environmental Services Office (216) 265-6185.

Ground support vehicle access to the CDF (Pad-1 or Pad-2) will be gained using the access/service road leading to the pad from the East Gate (E-24B) Service Road. Access to CDF Pad-1 requires crossing Taxiway K, which will be an active taxiway. Only authorized personnel with Aircraft Operating Area (AOA) driving privileges will be permitted unescorted access to Pad-1. Vehicle crossings at Taxiway K will be performed as follows:

- a. The vehicle operator shall stop short of Taxiway K at the marked hold position in order to monitor aircraft traffic on the taxiways.
- b. The vehicle operator shall give way to all aircraft prior to proceeding across Taxiway K at the vehicle operator's discretion.
- c. When crossing Taxiway K, the vehicle operator shall only operate the vehicle inside of the painted vehicle service road that crosses the taxiway.
- d. Alternate access routes to these locations must first be approved by DPC Airport Operations and coordinated with the FAA.

2.1.2 Approved Winter Anti-icing / De-icing Locations

The following anti-icing / de-icing locations shall be adhered to during Winter Deicing Activities (Figure 2).

- 1) Aircraft Design Groups III, IV, and V
 - a) Primary deicing for large and wide-body aircraft will be performed at the large Pad-1 of the CDF.
 - b) Secondary deicing, when required, will also be performed at Pad-1 of the CDF.
 - c) Each individual airline must execute an Agreement with the CDF Operator that addresses airline specific procedures.
- 2) Aircraft Design Groups I and II
 - a) Deicing of Design Group I and II will be performed on either Pad-1 or Pad-2 of the CDF.

3) Exceptions

All aircraft are expected to use appropriate pad(s) for de-icing.

The following exceptions are noted:

- a) Indoor hangar deicing where drainage is directed to a sanitary sewer system.
- b) Type IV anti-icing when less than 10 gallons is utilized per aircraft per occurrence.

- c) Atlantic general aviation aircraft (Design Group I or II) will be permitted to anti-ice / deice on the FBO apron. Large aircraft at Atlantic Aviation are required to conduct anti-icing / deicing at Pad-1.
 - d) UPS: deicing activities (all design groups) may be performed on the UPS ramp. Activities will be limited to UPS aircraft and contract airlines affiliated with UPS operations.
 - e) Air Services: limited general aviation (Design Groups I or II) may occur on the approved location of the Air Services ramp provided that deicing activities do not occur over open drains. The Collection Contractor shall be notified prior to deicing activities occurring.
 - f) FedEx: small prop aircraft (Design Group I) are permitted to conduct anti-icing / deicing at the ramp prior to take off. Maximum allowable application of deicing fluid per aircraft on the ramp shall not exceed 50 gallons.
 - g) Key Corp: limited general aviation aircraft (Design Group I or II) de-icing activities are permitted on the western most portion of the Key Corp ramp. Inland Waters of Ohio shall be contacted prior to activities occurring.
- 4) Secondary Deicing and Delays
- a) Should secondary deicing be required, aircraft will be routed back to the deicing pads by FAA Air Traffic Control (ATC) and upon completion of secondary deicing, will be routed to the most applicable runway for departure.
 - b) If take off delays are anticipated, a gate hold procedure will be coordinated with FAA ATC. This procedure will be implemented to keep secondary deicing to a minimum. Every effort will be made to keep the departure queue to not more than six (6) aircraft.

2.2 Standard Procedures

Standard Procedures indicated in this section as well as Gate Procedures identified in Section 2.3 shall adhere to the associated text with clarification from the flowchart indicated as Figure 3. The Centralized Deicing Facility Aircraft Movement Plan and associated figures clarifying aircraft movement from the gate to Pad-1 and Pad-2 can be referenced in Attachment A.

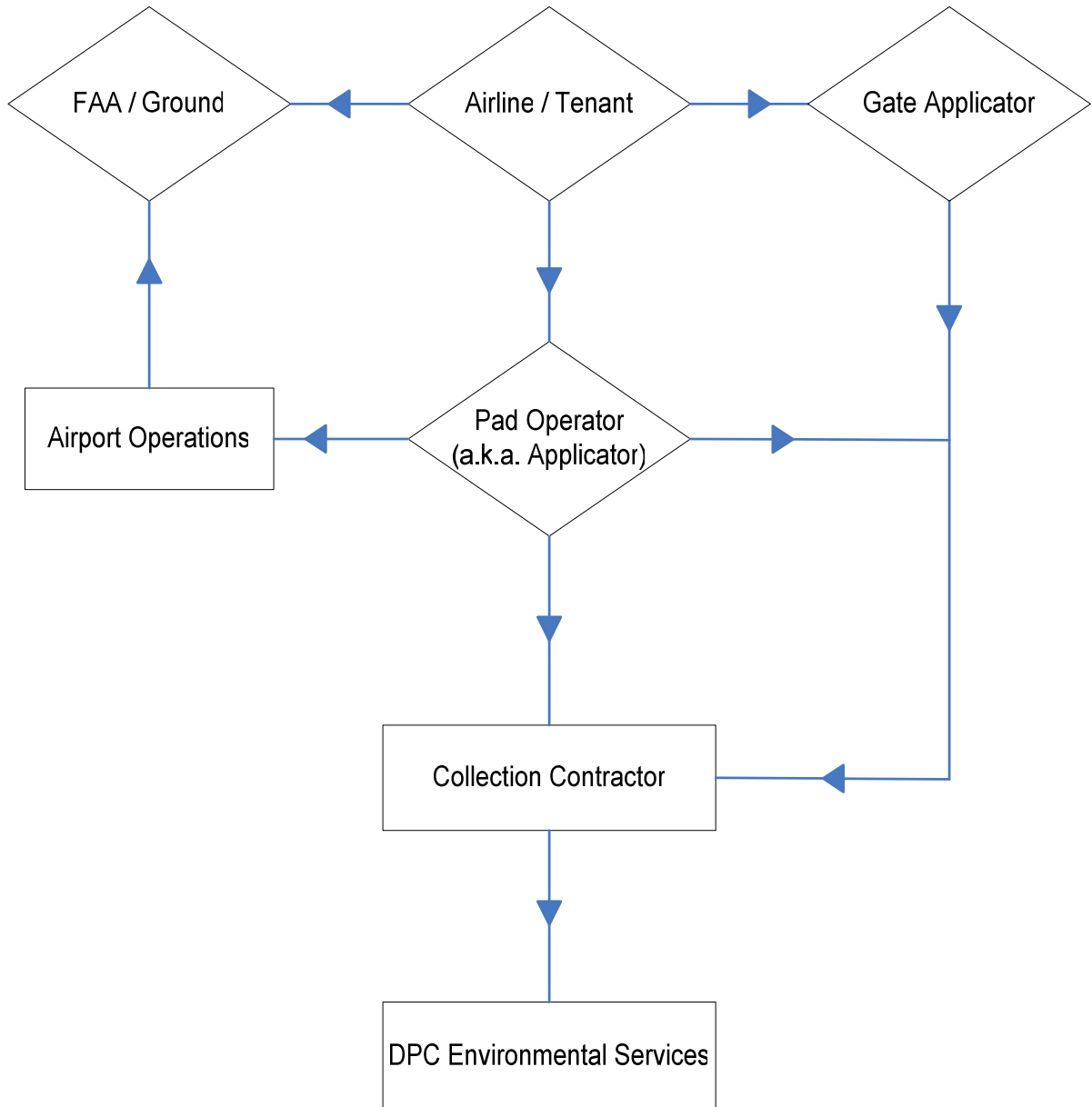
2.2.1 Pre Anti-icing / De-icing

- a. The applicator/operator will be notified by the airlines/tenants of anticipated Pad-1 and/or Pad-2 utilization. The applicator will be responsible for notifying the FAA, DPC Airport Operations, and the Collection Contractor as applicable and prior to commencement of anti-icing / deicing activities. The applicator will document:
 - 1) Time
 - 2) Pad being opened
 - 3) Airline/Tenant contact, name and telephone number
- b. At Pad-1 and/or Pad-2, the Collection Contractor will position the appropriate valves to divert flow to containment and ensure that all necessary pumps are operating. Immediately after being notified, the Collection Contractor will notify DPC Environmental Services.

DPC Environmental Services contact:

Kim McGreal	(216) 265-6615 (office)
	(216) 857-6867 (cell)
Beau Williams	(216) 265-6009 (office)
	(216) 857-7036 (cell)

Figure 3. Pre Anti-icing / De-icing Flowchart



2.2.2 Post Anti-icing / De-icing

- a. At the conclusion of the day's deicing activities, as appropriate, the applicator will notify the Collection Contractor and document the following:
 - 1) The name of the applicator making the call;
 - 2) The weather and or airline/tenant situation; and
 - 3) The time and location of the last aircraft that was deiced.
- b. At Pad-1 and Pad-2:
 - 1) Upon approval and direction of DPC Environmental Services, following completion of cleaning operations as described in Section 3.0 and a "first flush" (0.10" to 0.25") of non-impacted storm water through the collection system, the collection contractor may divert the collection system from fluid collection back to storm water system discharge.
 - 2) Applicator must ensure NO test spraying of fluid discharge or leaks occur after opening to storm water system discharge.
 - 3) The Collection Contractor must confirm these actions with the applicator, DPC Airport Operations and DPC Environmental Services prior to conducting this activity.

2.3 Gate Procedures

Under specific conditions application of de-icing or anti-icing fluids can be performed at the aircraft gates.

2.3.1 Allowable Circumstances

Application of anti-icing / deicing fluid to aircraft on the ramp in areas other than Pad-1 or Pad-2 is restricted to compliance with the Ohio EPA NPDES permit for CLE. The maximum allowable application of deicing fluid per aircraft on the ramp shall not exceed 150 gallons for Group IV and V, and 100 gallons for Group III or smaller.

Application of anti-icing and de-icing fluids may occur in the ramp area not associated with Pad-1 and/or Pad-2 only under one or more of the following circumstances:

- a. **Defrosting:** Defrosting is defined as the limited application of deicing fluids to an aircraft during dry weather, to remove minor accumulations of ice crystals that may have appeared in the absence of atmospheric precipitation. When pre-taxi inspection of an airplane during above-freezing ambient temperatures reveals the build-up of clear ice on critical components of the aircraft, including, but not limited to the windshield and inlet ducts, such that the FAA regulations require the defrosting or de-icing of those components before the aircraft may be taxied to the de-icing pad for complete defrosting or de-icing (if complete de-icing or defrosting is necessary), then de-icing fluid may be applied to the aircraft in order to comply with FAA regulations before leaving the gate or ramp.
- b. **Specific aircraft surfaces:** When the pre-flight inspection reveals the presence of ice or snow on critical components of the aircraft including but not limited to the taxi-gear or engine intake ducts, such that FAA regulations require deicing of those surfaces before the aircraft can be taxied to the deice pad, deicing fluid may be applied to those surfaces in order to comply with FAA regulations only before taxiing to the deicing pad.
- c. **Weight Reduction:** When the pre-flight inspection reveals a heavy accumulation of ice or snow on the aircraft, such that the aircraft exceeds the maximum structural weight permitted by FAA regulations. Other methods, such as physical measures or hot-compressed air, shall be exhausted prior to limited use of deicing fluid being applied in order to bring the aircraft under the maximum taxi weight permitted by the FAA. The aircraft will then be taxied to the deicing pad for removal of the remaining ice or snow.

- d. **Anti-icing:** For aircraft remaining at the gate or ramp overnight, or for cargo aircraft remaining on the ramp for an extended period during the day, anti-icing fluid (Type IV) may be applied if **all** of the following conditions are met:
- 1) Anti-icing fluid cannot be applied at the de-icing pad because no pilot or other authorized personnel are available to take the aircraft to the de-icing pad; and
 - 2) Overnight accumulation of ice, snow or frost on critical components for the aircraft including, but not limited to, the windshield and engine inlet ducts or anticipates the same type of accumulation during the day on a cargo aircraft; and
 - 3) The application of anti-icing fluid (Type IV) at the gate or ramp will reduce the necessity for later application of de-icing fluid (Type I) at the gate or ramp in order to comply with FAA requirements before taxiing to the de-icing pad for complete de-icing.

2.3.2 Procedures

Procedures for gate anti-icing / de-icing activities are as follows:

- a. Prior to commencing of gate activities, the operator shall notify DPC Environmental Services and Collection Contractor to ensure drain valves are closed and collection equipment available and/or standing by and document the following:
 - 1) The name of the airline,
 - 2) The name of the applicator (if other than the airline),
 - 3) The name of the person making the report and phone number,
 - 4) The time and gate/area at which the aircraft is to be de-iced/anti-iced
 - 5) Proper justification (identified as circumstance “a” through “d” in Section 2.3.1) and whether or not the aircraft has been on the ramp overnight
- b. DPC Environmental Services will regularly conduct monitoring of anti-icing and deicing activities.

c. All airlines and/or applicators, shall keep a Gate Anti-icing / De-icing Log (Attachment C), which shall include for each aircraft treated, a record of:

- 1) The date, time, temperature
- 2) The name of the airline
- 3) The name and contact number of the applicator
- 4) The aircraft type
- 5) The gate number
- 6) The type, concentration, and amount of fluid used
- 7) Whether or not the aircraft has been on the ramp overnight
- 8) Circumstance, as approved herein, justifying the activity and subsequent acknowledgement by DPC Environmental Services.

d. When anti-icing / deicing activities are committed at Pad-1 and/or Pad-2 applicators shall keep an Anti-icing / De-icing Log (Attachment D) which shall include a record of:

- 1) The date, time, temperature and weather condition
- 2) The name of the airline
- 3) The aircraft type
- 4) The type, concentration, and amount of fluid used

2.3.3 Post Gate Procedures

- a. All Ground Service Equipment (GSE) must be moved as close as possible to the terminal buildings after deicing operations have concluded so as to assist the Collection Contractor with sweeping the areas.
- b. GSE involved with anti-icing or de-icing operations must NOT park over open drains.
- c. Airlines/tenants shall work with DPC Environmental Services and the Collection Contractor to optimize the timing of collection efforts on all ramp area not associated with Pad-1 or Pad-2.

2.4 Summer Season Dry Weather Protocol

The Dry Weather Deicing (DWD) Program was introduced with the desire to be proactive towards minimizing collection activities during the summer season (April 16 through October 14).

The DWD begins at 5:30 am each day of the working week and concluded at 10:00 am. The Collection Contractor is instructed to traverse the concourses in an effort to observe any deicing operations being conducted. The Collection Contractor is also tasked with assisting with fuel spills, lavatory spills, ramp sweeping and the day-to-day operations where necessary.

If any airline, FBO, tenant is planning to de-ice or anti-ice they are instructed to notify the Collection Contractor (Inland Waters of Ohio, IWO (216) 408-1315) prior to deicing. If any other ramp related emergencies arise contact IWO between the hours of 5:30 am to 10:00am (1-800-869-3949).

3.0 SPENT FLUID COLLECTION AND DISCHARGE

During defrosting events, the gate Applicator/Operator shall provide to the Collection Contractor specific locations of gate activity. The Collection Contractor will clean such locations using glycol recovery vehicles (GRVs). The Collection Contractor is to be notified prior to these events to control drains and fluids. The Collection Contractor shall coordinate all GRV use with the tenants of the respective gate and ramp areas (Section 2.3.2).

Drain inserts on the ramp will remain closed at all times during winter deicing operations. The Collection Contractor is responsible for drain inserts and will open them only when a rainstorm is imminent during the deicing season or after the conclusion of the deicing season.

Recycling of collected spent anti-icing / de-icing fluids is encouraged by DPC. The Collection Contractor is responsible for appropriate discharge of collected spent anti-icing / de-icing fluids, whether it be to: the Northeast Ohio Regional

Sewer District (NEORSD), fluid destruction (through an approved waste collector), or to a vendor and the storm sewer system through recycling methodologies. Discharge of collected spent anti-icing / de-icing fluids shall be conducted in accordance with all permits and regulations.

3.1 Pre Anti-icing / De-icing

Prior to the start of deicing operations, the glycol collection tank selection valve system shall be opened solely to collection. The Collection Contractor will ensure that valves at each location are in the appropriate open position, for collection, and closed to the storm sewer system.

3.1.1 Collection Contractor Responsibilities

- a. Verify that appropriate valve(s) are in the proper position; **or** verify that any pumps necessary for the operation of the spent fluid collection system are on and operational;
- b. Visually inspect the containment tank(s) to verify that sufficient capacity is available, i.e. that the fluid in the tanks is at less than the Significant Storm Surge Protection (SSSP) levels for each tank;
- c. If a tank has exceeded the SSSP level the Collection Contractor will notify DPC Environmental Services for contingency plan instructions;
- d. Keep a log of the date and time for completion of “a” through “c”; and
- e. Report to DPC Environmental Services verbally on a daily basis, as well as through written weekly status updates.

3.2 Post Anti-icing / De-icing

The Collection Contractor may coordinate with the applicator at Pad-1 and Pad-2 to clean the pads using its GRVs at times when operations on the pads will not be affected. Priority GRV activities will be as follows:

- (1) Gate / ramp clean-up
- (2) Pad-1
- (3) Pad-2

4.0 ENFORCEMENT PROGRAM

Efficient pad operations require cooperation and communication between DPC and airlines/ tenants. Anti-icing / de-icing may occur only in designated areas of the Airport as identified in this Plan. DPC will monitor and enforce anti-icing and de-icing operations as well as the data reporting requirements stated within this Plan. Fines shall reimburse for response to offending party. The following infractions shall be documented and implemented through the Deicing Infraction Ticket and Dispute Resolution Policy stated herein.

4.1 Deicing Infraction Ticket

If DPC Airport Operations is unable to verify that de-icing or anti-icing is being conducted in accordance with this Plan or if flagrant violations of this Plan are observed by any party:

- a. DPC Airport Operations shall immediately notify one of the following:

<u>Call Sequence</u>	<u>Cell/Office</u>
1) 24 hour response IWO	800-869-3949
2) Kim McGreal, Environmental Manager	216-857-6867 216-265-6615
3) Jack Swedyk, Airport Operations Manager	216-857-2755 216-265-6090
4) Fred Szabo, Commissioner	216-265-6100

- b. DPC Airport Operations shall record the incident and notification in its log, including:

- 1) The Airline/tenant involved;
- 2) All of the individuals witnessing or involved in the event;
- 3) Time, location, and circumstances of the event; and
- 4) Notifications made.

- c. A CLE representative shall meet with the Airline/tenant involved to discuss and resolve the situation. As necessary, a Deicing Infraction Ticket will be issued (Attachment B).

4.1.1 Infraction Ticket Guidelines

Minor Infractions (not reaching the storm drain system):

Level A. First Time Occurrence = \$1,000.00 Fine

- a. The incident will be recorded,
- b. The Collection Contractor will be mobilized for spill recovery, and
- c. The tenant supervisor will be notified of spill recovery, and will subsequently be responsible for funding response for the event.

Level B. Repeat Occurrences = \$2,000.00 Fine

- a. The incident will be recorded,
- b. The Collection Contractor will be mobilized for spill recovery,
- c. The tenant supervisor will be notified of spill recovery, and will subsequently be responsible for funding response for the event,
- d. Violations noted will be written and reported to tenant Corporate management, and
- e. Ohio EPA fines realized for every violation of the NPDES permit will be the responsibility of the tenant.

Major Infractions (reaching storm drain system) and Repeat Occurrences:

Level C. First and Repeat Occurrences = \$5,000.00 Fine

- a. The incident will be recorded,
- b. The Collection Contractor will be mobilized for spill response,
- c. The tenant supervisor will be notified of spill response, and will subsequently be responsible for reimbursing cost to respond,
- d. Ohio EPA will be notified of the spill,
- e. Violations noted will be written and reported to tenant Corporate management, and
- f. Ohio EPA fines realized for every violation of the NPDES permit will be the responsibility of the tenant.

4.2 Penalties and Disclaimer

DPC has developed Aircraft Anti-icing / De-icing and Discharge Management Plan (Plan) to serve as an approved CLE policy for DPC staff, airlines/ tenants, and contractors. Since Airline/ tenants are strictly liable for complying with the Plan during anti-icing / de-icing conditions, and the Ohio EPA along with the DPC enforces such regulations, all parties are encouraged to adhere to the Plan.

The Director and/or the Commissioner of CLE has the authority to immediately suspend any anti-icing / de-icing activity or operation that is in violation of the procedures and practices established by this Plan and all applicable Federal, State and local governing regulatory agencies. The suspension will continue until project modifications are made to address the Plan concern as well as a written work continuation letter is issued by the DPC Environmental Services Office to the Airline/tenant.

This Plan has been adopted by DPC pursuant to *Section 10.01* of the Master Agreement and Lease and all requirements will be enforced based on the rules and regulations set forth therein.

5.0 SAFETY

Safety is the only factor that will necessitate the release or discharge of spent deicing fluids to the storm sewer system

DPC is committed to assuring that the spent anti-icing / de-icing fluid recovery procedures do not present a risk to the safety of individuals or aircraft operating on ramps or pads. Pursuant to the Federal Aviation Administration, Advisory Circular AC 150/5200-30A, Airport Winter Safety and Operations, pavement contaminants including snow, ice and slush should be removed as expeditiously as possible to maintain movement areas in a “no worse than wet” condition.

In the event that DPC is advised that a potential hazard or threat to safety condition exists on the aircraft aprons or deicing pads, which is the result of ponded deicing fluids or an equipment failure on the deicing pad, DPC may be required to release or discharge fluids to the storm sewers.

Prior to any release or discharge of fluids the Collection Contractor will make every effort to correct the potential hazard. If the condition cannot be corrected, the DPC Environmental Services Manager, in concert with the DPC Airport Operations supervisor on duty will contact the CLE Commissioner for authorization to open the appropriate inserts or valves in order to eliminate the condition.

DPC Environmental Services will be provided with all the relevant information regarding the reason for the release of fluids, the estimated amount released, estimated percent concentration of spent fluids, the location, time and weather will also be documented. The DPC Environmental Services Manager will then notify Ohio EPA of the release and provide the information listed above. All information will be documented and provided to the appropriate officials.

6.0 CHEMICAL APPROVAL

Anti-icing / de-icing chemical usage at CLE has changed since 1998 when urea and ethylene glycol were banned from use

6.1 Permitted Chemicals

Chemicals authorized for anti-icing and/or de-icing use at CLE are limited to:

- Propylene glycol (aircraft anti-ice / de-ice)
- Potassium acetate and sodium formate (pavements)
- Cryotech NAAC Deicer (pavements)

Additional deicing chemicals can be proposed to DPC and will be evaluated on an individual basis.

6.2 Prohibited Chemicals

The following chemicals are **NOT PERMITTED** for use at CLE under any circumstance:

- Urea
- Ethylene Glycol
- Calcium Chloride

If any banned chemical is discovered being utilized the substance will be considered a chemical hazard requiring full and complete spill response.

- a. Tenants will be responsible for spill response, removal of all remaining urea and/or ethylene glycol from CLE property, and submitting a certified acknowledgement that no further urea or ethylene glycol will be used or stored at CLE.
- b. Monetary fines or sanctions levied by the NEORSD and/or the Ohio EPA resulting from use of prohibited chemicals will be the responsibility of the violating tenant.

7.0 RECORD KEEPING AND REPORTING

7.1 Record Keeping

- a. Tenants and Operators will record data concerning application of anti-icing / de-icing fluids as described within this Plan. It is the responsibility of the tenant and/or operator to maintain records as needed for their contracting purposes.
- b. DPC will maintain documents reported by tenants and operators in the DPC Environmental Services office.
- c. DPC will maintain all documentation involving communication, infractions, outfall monitoring, or other pertinent information in the DPC Environmental Services office.

7.2 Reporting

- a. No later than the 7th of each month, the operator and each tenant, as applicable, shall fax to DPC Environmental Services, (216-265-6185) a copy of its Deicing Activities Report for the previous month using the forms designated by CLE.
- b. Copies of CLE Deicing Pad Logs and associated inspection reports by the applicator shall be submitted to DPC Environmental Services monthly.

- c. The Collection Contractor will record data regarding the CDF valve management, collection of all spent fluids (at pads and gate areas) and appropriate discharge of all spent fluids as described within this Plan.

1. **PAD DESCRIPTION:** The Centralized Deicing Facility (CDF) is comprised of two pads identified as Pad-1 and Pad-2 as shown in Figure-1 below. Deice Pad-1 is the primary pad, and has the capacity to operate up to six Group-3 aircraft bays simultaneously. Directly behind each of the deice positions is a secondary position that is used for aircraft queuing. Deice Pad-2 is a small Group-2 aircraft pad with access off of Twy K1, and has a single bay with queue space for 1-2 additional aircraft.

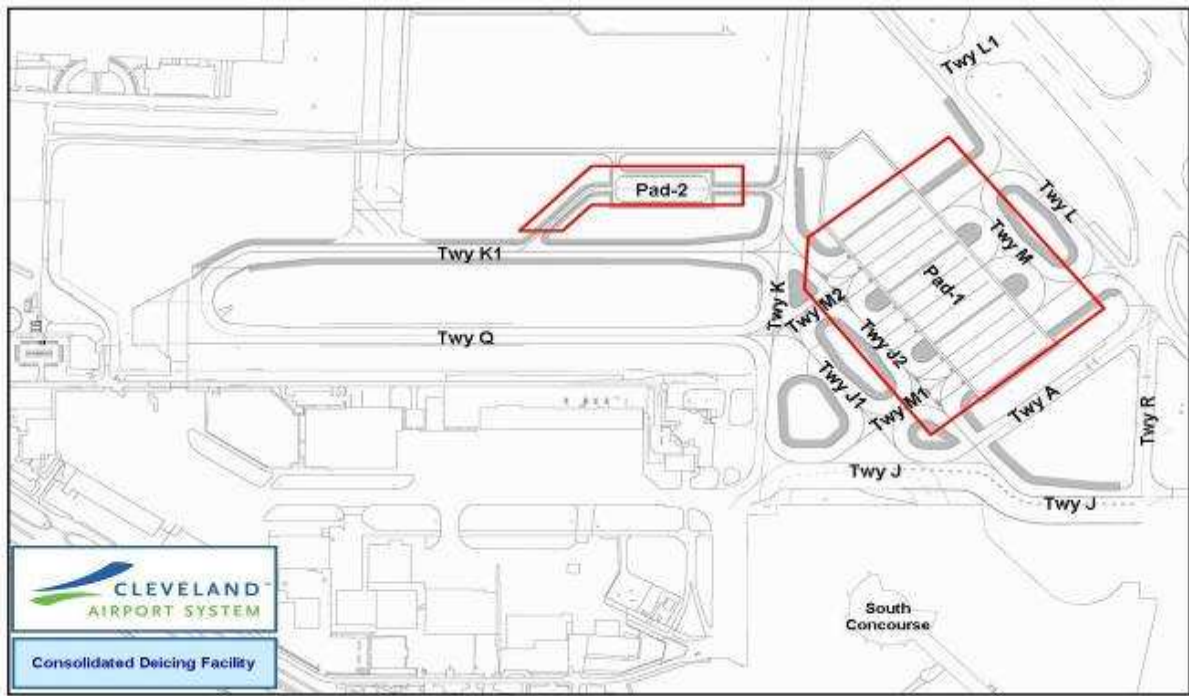


Figure-1

2. PROCEDURES

- a. The deice season is defined as the period beginning October 15th and ending April 15th.
- b. The following frequencies have been assigned for use by the CDF operator, AeroMag 2000 CLE, in deicing operations as indicated:
 - (1) 129.525 for aircraft movement control, call sign "AeroMag"
 - (2) 130.975 for deicing operation coordination, call sign "Iceman"
- c. CLE Airport Operations shall close the following taxiways by NOTAM during deice season to support the deicing operation:
 - (1) Taxiway "J2"

(2) Taxiway “M”

(3) Taxiways “M1” and “M2” between Taxiway “J2” and Taxiway “L”

The closed taxiway areas are enclosed by the red border around Pad-1 in Figure-1 above.

- d. AeroMag 2000 CLE will control the movement of aircraft on Pad-1 and Pad-2, and on the closed portions of the taxiways identified in 2.b. above, and shown in Figure-1 above as the areas inside the red borders.
- e. Handoff points between the CLE ATCT and AeroMag 2000 CLE for aircraft entering Pad-1 shall be at Taxiway “J2” or Taxiway “M1” or “M2” crossing Taxiway “J2.” CLE ATCT shall change aircraft to AeroMag 2000 CLE on frequency 129.525 prior to the handoff points.
- f. The handoff point between the CLE ATCT and AeroMag 2000 CLE for aircraft entering Pad-2 shall be the entry to Pad-2 off of Taxiway “K1.” CLE ATCT shall change aircraft to AeroMag 2000 CLE on frequency 129.525 prior to the handoff point.
- g. All aircraft requiring deicing at the CDF shall coordinate with AeroMag 2000 CLE prior to making initial contact with ATC for taxi.

3. PAD-1 USE AND CONFIGURATION

- a. Deice Pad-1 shall be used as the primary deice pad.
- b. When Deice Pad-1 is full, additional aircraft queuing will be conducted using Taxiway Q and Taxiway K1.
- c. AeroMag 2000 CLE will notify CLE Airport Operations when the Pad-1 queue space is full. CLE Airport Operations will then notify CLE ATCT the queue configuration is in effect.
- d. AeroMag 2000 CLE will notify CLE Airport Operations when they determine that the Pad-1 queue space can again handle the deicing operation queuing needs. CLE Airport Operations will then notify CLE ATCT that Pad-1 queuing is available.
- e. When deicing is complete, AeroMag 2000 CLE shall instruct all aircraft to hold short of Taxiway “L” and contact ground control.

4. PAD-2 USE AND CONFIGURATION

- a. Pad-2 can accommodate Group-2 aircraft with access off of Taxiway “K1.” Group 2 aircraft are required to receive prior approval from AeroMag 2000 CLE in order to use Pad-2. Any Group 2 aircraft receiving authorization for Pad-2 shall advise ground control on initial contact.
- b. When deicing is complete all aircraft shall be instructed to hold short of Taxiway “K” and contact ground control.

Attachment B



No. _____

Deicing Infraction Ticket

The Department of Port Control witnessed a(n) _____ aircraft being anti-iced or de-iced by _____ at _____ (an unapproved deicing location) on _____, 200__.

This infraction was a Minor / Major infraction and a First / Repeat occurrence for this tenant at this location.

The Aircraft Anti-icing / De-icing and Discharge Management Plan (Plan) clearly identifies all approved and unapproved deicing locations. Per Section 4.0 Enforcement Program in the Plan, the party receiving this ticket is issued an:

Infraction Level A = \$1,000.00 fine

Infraction Level B = \$2,000.00 fine*

Infraction Level C = \$5,000.00 fine*

Payable to the Department of Port Control.

*Infraction Level B and Level C may have additional fines as levied by the Ohio Environmental Protection Agency.

This Deicing Infraction Ticket is issued per the authority of the Department of Port Control.

Ricky D. Smith, Director
Department of Port Control

For questions or issues concerning this ticket, please contact Kim McGreal, DPC Environmental Service Manager at 265-6615.



Dispute Resolution Policy

Upon receipt of a Deicing Infraction Ticket, the ticketed party may appeal the ticket by filing a written response identifying justification of the appeal.

This appeal must be submitted within 72 hours of receipt.

Appeals should be addressed to:

Kim McGreal, DPC Environmental Service Manager
5300 Riverside Drive
P.O. Box 81009
Cleveland, OH 44181-0009
(216) 265-6185 (fax)
Or electronically at kmcgreal@clevelandairport.com

The circumstances of the appeal will be evaluated by DPC. DPC may request evidence or convene a fact finding hearing if deemed appropriate. At the conclusion of the appeal process, the DPC's determination will be final and a written response will be returned to the ticketed party.

For questions or issues concerning this ticket, please contact Kim McGreal, DPC Environmental Service Manager at 265-6615.

Attachment C**Cleveland Hopkins International Airport - Department of Port Control****Gate Daily Glycol Usage Tracking Form**

Reporting Date: _____
Reporting Applicator
(Airline/Tenant): _____

Contact Person
Name: _____
Contact Phone
Number: _____

Deicing Area	Aircraft Type Deiced (e.g., 737)	Propylene Type I* Deicing Fluid Dispensed	Propylene Type IV* Deicing Fluid Dispensed	Remarks/ Comments (e.g., concentration 50/50 or RON)
(Example: Gate A-4)		0	0	
		0	0	
		0	0	
Total		0	0	

Justification:**Circumstances in addition to Justification (if any):****Daily Pavement Chemical Usage**

Area Chemical Applied (e.g., Ramp at Gates X, Y, and Z)
Gates X,Y,Z

Type of Chemical Applied= _____ Quantity Applied (lbs.) = _____

FAX completed form to Kim McGreal @ (216) 265-6185 by 8:00am the following day or email to kmcgreal@clevelandairport.com

Please report information only when deicing and/or pavement chemical usage has occurred.

For questions please contact: Kim McGreal at (216) 265-6615

Attachment D
CENTRALIZED DE-ICNG PAD-1 AND PAD-2

CONFIRMATION SLIPS

Carrier:

Day:

			----Glycol ---		----- Time -----					
Slip Flight	A/C Type	Registration Tail	Type I	Type IV	Arrival	Departure	Total	T°	Weather	A/C Condition

APPENDIX C

Aircraft Deicing Fluid Usage ACRP ADF Usage v. EPA ADF Usage Estimates

This table compares EPA's estimated ADF usage by airport with the ADF usage data reported in ACRP Report 11-02 (Task 10) – Estimate of National Use of Aircraft- and Airfield-Deicing Materials (2008). The ACRP report's national estimate of 15,200,000 gallons of ADF used was based on 183 airports. By comparison, the table only compares ADF usage at the 153 airports for which EPA developed estimates. Additionally, EPA developed estimates for many airports for which no data was developed through ACRP (highlighted in yellow). If we were to assume EPA's ADF usage estimates for those airports are correct, the total ACRP estimate for these airports increases from 14,441,693 gallons to 14,834,963 gallons (55% overestimation).

			Color coding:	Reported
				Estimated
				Missing
		EPA Estimates of Deicer Usage	ACRP Estimates	
Airport ID	Airport Name	Total ADF Estimate	ACRP 11-02 Estimate	EPA Overestimate
		(Gals Glycol)	(Gals Glycol)	
1138	Detroit Metropolitan Wayne County	2,152,292	1,851,517	16%
1006	Chicago O'Hare International	1,516,626	1,270,082	19%
1126	Minneapolis-St Paul International/World-Chamberlain	1,456,538	1,085,858	34%
1145	Newark Liberty International	1,123,057	656,038	71%
1142	Washington Dulles International	1,076,083	276,652	289%
1028	Denver International	1,053,570	713,772	48%
1053	General Edward Lawrence Logan International	985,296	339,506	190%
1139	Philadelphia International	979,983	337,674	190%
1107	Pittsburgh International	943,982	593,629	59%
1113	Cincinnati/Northern Kentucky International	722,995	391,251	85%
1069	Cleveland-Hopkins International	582,321	414,247	41%
1066	Salt Lake City International	570,540	360,644	58%
1089	John F Kennedy International	560,031	257,009	118%
1029	La Guardia	485,158	379,440	28%
1024	Indianapolis International	452,155	342,170	32%
1109	Airborne Airpark	432,416	333,712	30%
1129	Bradley International	427,068	279,279	53%
1012	Ted Stevens Anchorage International	420,735	345,166	22%
1020	Hartsfield - Jackson Atlanta International	362,235	61,432	490%
1011	Lambert-St Louis International	325,122	258,257	26%
1036	Baltimore-Washington International	323,623	230,508	40%

1095	Chicago Midway International	293,834	369,075	-20%
1111	Port Columbus International	288,374	107,607	168%
1021	Buffalo Niagara International	284,654	147,505	93%
1059	Greater Rochester International	229,158	102,501	124%
1141	Ronald Reagan Washington National	219,533	72,732	202%
1148	Kansas City International	203,725	158,863	28%
1140	Memphis International	199,174	113,172	76%
1080	Syracuse Hancock International	186,351	92,839	101%
1079	Manchester	177,307	103,961	71%
1026	Dallas/Fort Worth International	166,790	91,630	82%
1023	Seattle-Tacoma International	157,464	33,453	371%
1136	General Mitchell International	152,944	150,085	2%
1121	Theodore Francis Green State	150,127	111,731	34%
1150	Greater Rockford	146,856	12,577	1068%
1128	Charlotte/Douglas International	143,572	129,616	11%
1108	Louisville International-Standiford Field	128,409	105,247	22%
1065	Albany International	125,775	156,514	-20%
1101	Portland International	112,086	38,208	193%
1068	Eppley Airfield	110,986	85,140	30%
1147	Raleigh-Durham International	102,451	85,140	20%
1058	Gerald R. Ford International	97,174	70,113	39%
1078	Nashville International	91,543	28,627	220%
1123	James M Cox Dayton International	90,580	160,352	-44%
1010	Fairbanks International	83,335	21,492	288%
1124	Des Moines International	80,455	45,324	78%
1112	Deadhorse	78,960		#DIV/0!
1070	City of Colorado Springs Municipal	75,817	34,170	122%
1116	Reno/Tahoe International	74,632	67,538	11%
1090	Boise Air Terminal/Gowen Fld	71,421	47,998	49%
1018	Piedmont Triad International	68,741	12,091	469%
1152	Duluth International	68,169		#DIV/0!
1105	Spokane International	67,984	55,912	22%
1014	Albuquerque International Sunport	64,460	16,819	283%
1017	Austin Straubel International	62,133	22,474	176%
1009	Cold Bay	61,177		#DIV/0!
1153	Akron - Canton Regional	60,246	48,834	23%
1031	Richmond International	59,337	14,256	316%
1088	Outagamie County Regional	57,845	15,473	274%
1022	Fort Wayne International	50,412	27,821	81%
1007	Yeager	49,561	28,359	75%
1057	Will Rogers World	49,504	7,720	541%
1103	Juneau International	48,014	58,841	-18%
1100	Toledo Express	46,449	26,565	75%
1051	Barnstable Muni-Boardman/Polando Field	46,147	52,493	-12%
1144	Central Wisconsin	43,624	12,537	248%

1046	Long Island Mac Arthur	43,528	24,357	79%
1131	Wilkes-Barre/Scranton International	42,537	16,083	164%
1041	Glacier Park International	38,555	1	#N/A
1137	Dallas Love Field	37,219	2,218	1578%
1091	Rochester International	34,556	102,501	-66%
1054	Jackson Hole	34,131	17,754	92%
1044	Roanoke Regional/Woodrum Field	32,927	8,078	308%
1114	Stewart International	32,276	4,116	684%
1004	Norfolk International	30,875	10,635	190%
1146	Northwest Arkansas Regional	30,775	4,292	617%
1074	South Bend Regional	29,585	45,889	-36%
1120	Rapid City Regional	25,423	10,416	144%
1092	Lewiston-Nez Perce County	24,859	2,423	926%
1032	Austin-Bergstrom International	24,044	4,853	395%
1151	Kalamazoo/Battle Creek International	22,002	26,627	-17%
1084	Bismarck Municipal	20,997	9,319	125%
1063	Evansville Regional	20,149	2,254	794%
1067	Helena Regional	18,381	11,150	65%
1003	Ketchikan International	18,182		#DIV/0!
1087	El Paso International	16,228	8,470	92%
1050	Aspen-Pitkin Co/Sardy Field	15,018	23,557	-36%
1005	Roberts Field	14,987	8,330	80%
1061	William P Hobby	14,168	6,397	121%
1098	Aberdeen Regional	13,976		#DIV/0!
1134	St George Municipal	13,950		#DIV/0!
1002	Bert Mooney	13,592		#DIV/0!
1132	Chippewa Valley Regional	13,262		#DIV/0!
1016	Tri-State/Milton J. Ferguson Field	12,945		#DIV/0!
1130	San Antonio International	12,749	4,902	160%
1117	Cherry Capital	11,524	27,044	-57%
1064	Falls International	11,375	15,968	-29%
1119	Rickenbacker International	10,711	10,055	7%
1033	Mc Carran International	10,644	2,860	272%
1037	George Bush Intercontinental Airport/Houston	10,243	19,797	-48%
1127	Willow Run	10,224	7,333	39%
1030	Williamsport Regional	10,071		#DIV/0!
1085	Waterloo Municipal	7,821		#DIV/0!
1082	Trenton Mercer	5,393		#DIV/0!
1094	Boeing Field/King County International	5,156	5,920	-13%
1062	Birmingham International	5,002	9,867	-49%
1071	Tweed-New Haven	4,926		#DIV/0!
1118	Bethel	4,897	66,980	-93%
1097	Lovell Field	4,150		#DIV/0!
1013	Wiley Post-Will Rogers Mem	3,056		#DIV/0!
1104	Nome	3,047		#DIV/0!

1043	Ralph Wien Memorial	2,500		#DIV/0!
1008	Tucson International	2,342		#DIV/0!
1052	Wilmington International	2,175		#DIV/0!
1015	Gulfport-Biloxi International	1,551		#DIV/0!
1149	Fort Worth Alliance	1,523		#DIV/0!
1135	Lafayette Regional	1,489		#DIV/0!
1047	Sacramento Mather	1,282		#DIV/0!
1096	Santa Fe Municipal	1,108		#DIV/0!
1086	Palm Beach International	1,023		#DIV/0!
1115	Jacksonville International	1,001		#DIV/0!
1122	Southwest Florida International	950		#DIV/0!
1072	Gillette-Campbell County	880		#DIV/0!
1027	Craven County Regional	878		#DIV/0!
1075	Pensacola Regional	828		#DIV/0!
1025	Tupelo Regional	821		#DIV/0!
1048	Redding Municipal	692		#DIV/0!
1110	Aniak	476		#DIV/0!
1001	Montgomery Regional (Dannelly Field)	232		#DIV/0!
1060	Williamson County Regional	149		#DIV/0!
1143	San Francisco International	105		#DIV/0!
1019	Ontario International	34		#DIV/0!
1034	Metropolitan Oakland International	0		#DIV/0!
1035	San Diego International	0		#DIV/0!
1038	Luis Munoz Marin International	0		#DIV/0!
1039	Kahului	0		#DIV/0!
1040	Louis Armstrong New Orleans International	0		#DIV/0!
1042	Orlando International	0		#DIV/0!
1045	Norman Y. Mineta San Jose International	0		#DIV/0!
1049	Lanai	0		#DIV/0!
1055	Miami International	0		#DIV/0!
1056	Santa Maria Pub/Capt G Allan Hancock Field	0		#DIV/0!
1073	Honolulu International	0		#DIV/0!
1077	Kona International at Keahole	0		#DIV/0!
1081	Bob Hope	0		#DIV/0!
1083	Tampa International	0		#DIV/0!
1093	Los Angeles International	0		#DIV/0!
1099	Sacramento International	0		#DIV/0!
1102	John Wayne Airport-Orange County	0		#DIV/0!
1106	Fort Lauderdale/Hollywood International	0		#DIV/0!
1125	Sarasota/Bradenton International	0		#DIV/0!
1133	Phoenix Sky Harbor International	0		#DIV/0!
	Totals:	23,021,271	14,441,693	59%

APPENDIX D

Photographic Evidence of Limited Deicing Fluid Available for Collection Following Defrosting

During defrosting events, application of aircraft deicing fluid (ADF) typically results in only damp or moist pavement conditions under a deiced plane, with no or limited flow to drains and collection systems. Glycol recovery vehicle (GRV) collection is difficult under such conditions. The pavement areas under defrosted aircraft will typically dry within a few hours, especially under sunny conditions, as the ADF volatilizes and/or degrades. Nearly all ADF applied for defrosting is thus, in effect, uncollectible. The example photographs below show the limited ADF that remains on pavement after aircraft defrosting.

Tallahassee Regional Airport:

These two photographs show the ADF remaining on the pavement after the defrosting of two RJ's at Tallahassee Regional Airport. The two aircraft were parked at adjacent gates. As the crew finished defrosting the first aircraft, they moved directly to the second. After the second aircraft departed, the photographs were taken. The first aircraft had been gone for about 20 minutes and the second is just out of the picture taxiing to the runway. As the photographs show, even after as short as 20 minutes, the amount of material that is available for collection is significantly reduced. Due to safety concerns with the second aircraft starting and taxiing from the adjacent spot, the recovery crew would not have been able to get to the first spot any sooner, even if the SASO/airline had staff available for collection.





Phoenix Sky Harbor International Airport:

These three photographs show the ADF remaining following defrosting activities at Phoenix Sky Harbor International Airport. Photograph 1 shows a swath of deicing fluid on the ramp as the slick streak directly behind the ramp worker's foot. Photograph 2 shows that 'no visible deicer' remains on the ramp by the time the aircraft pushes back, allowing recovery operations to safely begin. Photograph 3 shows the water streaks from the ramp scrubber after the deicing area is cleaned.



Photograph 1



Photograph 2

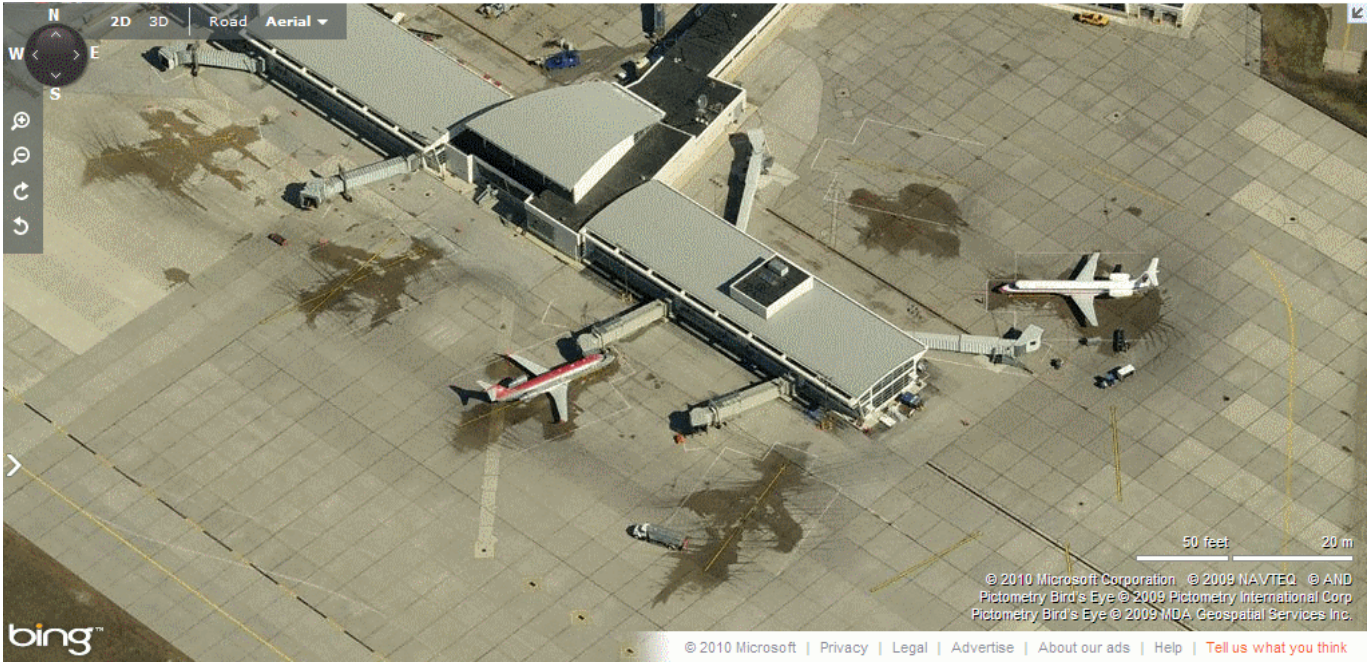


Photograph 3

Quad City International Airport (Moline, IL):

The two photographic screen shots show the limited ADF remaining on the airport pavement after defrosting operations.





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APPENDIX E
Operational Cost Calculations

Operational Impacts and Costs of Conducting All Deicing/Defrosting at Pads for the 7 Airports Projected by EPA to Install Pads to Meet 60% Collection Requirement

Code	Airport Name	Departures/yr		Glycol use in gals/yr	Split glycol use (gals/yr)		Implied # planes or flights/yr		Additional Operational Costs/yr Due to ELG			
		All	Jet		Defrosting	Deicing	Defrosted	Deiced	Defrosting - planes*	Deicing - planes	Deicing - passengers	Total
ORD	Chicago, IL: O'Hare	430,558	430,557	1,516,626	394,567	1,122,059	10,301	10,975	\$23,297,542	\$38,618,753	\$43,836,410	\$105,752,705
JFK	New York, NY: Kennedy International	214,605	212,441	560,031	145,698	414,333	3,804	4,053	\$8,602,869	\$14,260,391	\$16,187,067	\$39,050,328
EWR	Newark, NJ: Newark Liberty International	210,846	192,118	1,123,057	292,176	830,882	7,628	8,127	\$17,251,762	\$28,597,074	\$32,460,734	\$78,309,571
LGA	New York, NY: La Guardia	183,626	160,445	485,157	126,219	358,938	3,295	3,511	\$7,452,708	\$12,353,847	\$14,022,936	\$33,829,492
BOS	Boston, MA: Logan International	169,328	145,243	995,249	258,925	736,324	6,760	7,202	\$15,288,441	\$25,342,610	\$28,766,570	\$69,397,621
IAD	Washington, DC: Dulles International	150,757	137,731	1,076,083	279,955	796,128	7,309	7,787	\$16,530,171	\$27,400,941	\$31,102,994	\$75,034,106
CLE	Cleveland, OH: Hopkins International	108,270	90,477	582,321	151,497	430,824	3,955	4,214	\$8,945,279	\$14,827,982	\$16,831,343	\$40,604,605
	Total											\$441,978,427

- * Assumes no passengers on plane when defrosted
- Estimates regarding departures and total glycol use for these 7 airports is from EPA, Technical Development Document, pages 10-9 and 10-10.
 - ADF usage assumptions, based on data from MSP across 06/07, 07/08 and 08/09 deicing seasons (see MSP Data tab):

% of total ADF usage for defrosting26.0%

Avg gallons/aircraft applied for defrosting38.3

Avg gallons/aircraft applied for deicing102.2
 - Operational impact of conducting all deicing/defrosting at pads rather than gate/apron or elsewhere

EPA estimate of addl time/flight reqd for deicing15 min addl time taxiing from gate/apron to pad

(Technical Development Document, pages 12-4 through 12-8)30 min addl time idling at pad while being deiced

15 min addl time taxiing from pad to runway

Our estimate of addl time/plane reqd for defrosting15 min addl time taxiing from overnight storage to pad

(based on EPA deicing time estimates)15 min addl time idling at pad while being defrosted

15 min addl time taxiing from pad to gate
 - Operational cost factors

Variable operating cost/minute for scheduled commercial service: fuel, crew, etc.\$58.65 From FAA and ATA, for 2008. Adjusted to count variable operating costs only

Cost per passenger-hour, for delay time involving occupied planes\$35.70 From ATA, updating FAA unit values to 2008

Avg. passengers/plane for scheduled commercial service111.9 From DOT/BTS for 12 months ending 10/09.

Figure is calculated as revenue passenger miles/revenue aircraft miles (for scheduled service)
- Sensitivity Analysis:**
- Assume 0% of total ADF is used for defrosting, and retain MSP figures regarding usage/aircraft

\$465,789,991

Resulting total estimated annual operational costs across the 7 airports

Assume 100% of total ADF is used for defrosting, and retain MSP figures regarding usage/aircraft

\$381,444,045

Resulting total estimated annual operational costs across the 7 airports

Data from MSP Regarding Deicing and Defrosting -- 06/07, 07/08 and 08/09 Seasons

	06/07	07/08	08/09	Total
Glycol applied -- frost days	155,902	355,278	348,217	859,397
Glycol applied -- precipitation days	529,747	1,022,015	892,170	2,443,932
Total glycol applied	685,649	1,377,293	1,240,387	3,303,329
% total glycol usage for defrosting	22.7%	25.8%	28.1%	26.0%
Aircraft defrosted -- frost days	5,327	8,772	8,338	22,437
Aircraft defrosted -- precipitation days	5,783	9,545	8,576	23,904
Total aircraft treated	11,110	18,317	16,914	46,341
% total aircraft treated on frost days	47.9%	47.9%	49.3%	48.4%
Avg glycol/aircraft -- frost days	29.3	40.5	41.8	38.3
Avg glycol/aircraft -- precipitation days	91.6	107.1	104.0	102.2
Avg glycol/aircraft -- all days	61.7	75.2	73.3	71.3

APPENDIX F

Cost Effectiveness Calculations

Toxicity:

Cost-Effectiveness Calculations -- Using EPA's Figures

Costs:		Sources: TDD page 11-40 and Preamble page 44702
Pavement provisions	\$3.8 million\$/yr	Costs are expressed in 2006 dollars
ADF provisions	\$87.5 million\$/yr	
Total	\$91.3 million\$/yr	

Load Reductions:		Sources: EIB page 4-17, and further detail from EPA's "Airport Impact Model" in docket
Pavement COD	12.7 million lbs/yr	
Pavement Ammonia	4.654 million lbs/yr	
ADF COD	27.2 million lbs/yr	

Cost-Effectiveness for Toxicity Removal (Priority + Nonconventional Pollutants)

Conversion of COD removal estimates to share of PG vs. EG:		
lbs COD per gallon of PG	14.54	Calculated from relationships between Tables 10-4 and 10-6 in TDD
lbs COD per gallon of EG	11.97	
fraction of ADF effluent consisting of PG by volume	0.89	Derived by CH2MHill from Table 1 in "Airport Deicing Loading Calculations" -- EPA-HQ-OW-2004-0038-1107
wtd average lbs COD per gallon of PG/EG mix	14.2573	Calculated from figures just above
Benchmark for toxicity cost-effectiveness analysis	\$404	Per TWPE, in 1981 \$ (from Electronics 1 ELG, the previous ELG with the highest cost per TWPE)
	\$857	In 2006 \$. Adjustment factor: <i>Engineering News Record</i> Construction Cost Index: 3535 in 1981, approx 7500 in 2006

For ADF provisions:

27.2 million lbs/yr of COD abated is equivalent to	1,907,795	gallons PG/EG mix not discharged		
or	1,697,937	gallons PG not discharged		
and	209,857	gallons EG not discharged		
or equivalent also to	14,636,219	Pounds PG not discharged	Density of PG in lbs/gal is	8.62
	1,943,280	Pounds EG not discharged	Density of EG in lbs/gal is	9.26
Corresponding amount of toxicity-weighted pounds abated is:	837.2	From PG not discharged	Freshwater TWF for PG is	0.0000572
	2,604.0	From EG not discharged	Freshwater TWF for EG is	0.00134
Total:	3,441.2	TWPE abated from ADF		
Cost-effectiveness calculation for ADF:	\$87,500,000	Cost		
	3,441.2	TWPE abated		
	\$25,427	Cost per TWPE abated (in 2006\$)		Compare with \$857 highest previous ELG

Source: Dec. 2004 version of Toxic Weighting Factors Database
DCN 02012. Docket # EPA-HQ-OW-2004-0032-0855

For Pavement provisions:

4,654,000 lbs of ammonia discharge abated				
5,590,229 lbs of Na acetate would be needed to replace urea		Na acetate replaces urea at 66 - 70% by weight. Source: TDD, page 11-40		
(Note, though, EPA assumes urea will be replaced solely with potassium acetate solution)				
1,739,221 gallons of K acetate soln is needed to replace urea		Specific gravity of 70% K acetate solution is:	1.57	
		Density of 70% K acetate solution is thus:	13.08 lbs/gal	
22,745,710 lbs of K acetate soln is needed to replace urea		Lbs of K acetate in this qty of soln is	8,260,101 lbs	
Corresponding amount of toxicity-weighted pounds abated is:	5,165.9	From ammonia not discharged	Freshwater TWF for NH3 is	0.00111
	-912.7	From addl K acetate	Freshwater TWF for K acetate is	0.0001105
Total:	4,253.2	TWPE abated from Pavement		
Cost-effectiveness calculation for pavement:	\$3,800,000	Cost		
	4,253.2	TWPE abated		
	\$893	Cost per TWPE abated (in 2006\$)		Compare with \$857 highest previous ELG

Source: 12/04 TWF Database
Source: 11/2/07 CH2M memo

For entire proposed rule:

Cost-effectiveness calculation for entire rule:	\$91,300,000	Cost		
	7,694.4	TWPE abated (ADF + pavement)		
	\$11,866	Cost per TWPE abated (in 2006\$)		Compare with \$857 highest previous ELG

Deriving the pavement chemical relationships that EPA uses:

Sample Airport	Urea (lbs)	NH3 (lbs)	COD net (lbs)	COD - from urea	COD + from Na Acetate
Yeager	26,650	15,087	41,133	56,797	15,663
BOS	5,700	3,227	8,798	12,148	3,350
SLC	1,467,340	830,662	2,264,796	3,127,198	862,402
MHT	22,500	12,737	34,728	47,952	13,224
Ratio vs COD net	0.6479	0.3668	1.0000	1.3808	0.3808
Ratio vs NH3	1.7664	1.0000	2.7264	3.7646	1.0382
Total for reg projected	8,228,308	4,658,180	12,700,000 12,700,000	17,536,331	4,836,022
Total for reg projected	8,220,925	4,654,000	12,688,605	17,520,596	4,831,683

Calculations for replacing urea with potassium acetate for pavement deicing

Avg urea cost/ton	\$286.71	\$268.17	\$280.57	\$297.90	\$300.21
Avg Kac 70% soln cost/gal	\$2.86	\$2.81	\$2.86	\$2.86	\$2.92
Natl cost for urea use	\$1,178,521				
Natl cost for Kac soln use	\$4,978,521				
Est gal Kac soln use	1,739,221				

From pages 11-39
and 11-40 of TDD

Conventional Pollutants:

Cost-Effectiveness Calculations -- Using EPA's Figures

Costs:		
Pavement provisions	\$3.8	million\$/yr
ADF provisions	\$87.5	million\$/yr
Total	\$91.3	million\$/yr

Sources: TDD page 11-40 and Preamble page 44702
Costs are expressed in 2006 dollars

Load Reductions:		
Pavement COD	12.7	million lbs/yr
Pavement Ammonia	4.654	million lbs/yr
ADF COD	27.2	million lbs/yr

Sources: EIB page 4-17, and further detail from EPA's "Airport Impact Model" in docket

Cost-Effectiveness for Conventional Pollutant Removal

Assume: 1.67 pounds COD per pound of BOD₅ for deicing chemicals
or 0.5988 pounds BOD₅ per pound of COD for deicing chemicals
Source: EPA TDD, page 10-19

Load Reductions:			
Pavement COD	12.7	million lbs/yr	equals 7.6 million lbs BOD ₅ abated
Pavement Ammonia	4.654	million lbs/yr	equals 0.0 million lbs BOD ₅ abated
ADF COD	27.2	million lbs/yr	equals 16.3 million lbs BOD ₅ abated

Benchmark for cost-effectiveness analysis for conventional pollutants	\$0.25	Per pound, in 1976 \$ ("POTW Test", part of the BCT cost test)
	\$0.86	In 2006 \$. Adjustment factor: RS Means Historical Cost Index: 46.9 in 1976, approx 162 in 2006

For ADF provisions:

Cost-effectiveness calculation for ADF:	\$87,500,000	Cost	Compare with \$0.86/lb, POTW Test part of BCT cost test
	16.3	million lbs BOD ₅ abated	
	\$5.37	Cost per lb BOD ₅ abated (in 2006\$)	

For Pavement provisions:

Cost-effectiveness calculation for pavement:	\$3,800,000	Cost	Compare with \$0.86/lb, POTW Test part of BCT cost test
	7.6	million lbs BOD ₅ abated	
	\$0.50	Cost per lb BOD ₅ abated (in 2006\$)	

For entire proposed rule:

Cost-effectiveness calculation for entire rule:	\$91,300,000	Cost	Compare with \$0.86/lb, POTW Test part of BCT cost test
	23.9	million lbs BOD ₅ abated	
	\$3.82	Cost per lb BOD ₅ abated (in 2006\$)	

Nutrients:

Cost-Effectiveness Calculations -- Using EPA's Figures

Costs:		Sources: TDD page 11-40 and Preamble page 44702
Pavement provisions	\$3.8 million\$/yr	Costs are expressed in 2006 dollars
ADF provisions	\$87.5 million\$/yr	
Total	\$91.3 million\$/yr	
Load Reductions:		Sources: EIB page 4-17, and further detail from EPA's "Airport Impact Model" in docket
Pavement COD	12.7 million lbs/yr	
Pavement Ammonia	4.654 million lbs/yr	
ADF COD	27.2 million lbs/yr	

Cost-Effectiveness for Nutrient Removal

		Assume:	0 pounds total N per pound of COD	
		and	0.8235 pounds total N per pound of NH ₃ (based on atomic weights)	
Load Reductions:				
Pavement COD	12.7 million lbs/yr	equals	0.0 million lbs total N abated	
Pavement Ammonia	4.654 million lbs/yr	equals	3.8 million lbs total N abated	
ADF COD	27.2 million lbs/yr	equals	0.0 million lbs total N abated	
Benchmark for cost-effectiveness analysis for nutrients		Several \$ per pound of total N, perhaps up to \$10		
		Source: Appendix A to <i>Economic and Environmental Benefits Analysis</i> , Meat and Poultry Products ELG		

For ADF provisions:

Cost-effectiveness calculation for ADF:	\$87,500,000	Cost	
	0.0	million lbs total N abated	
	Infinite	Cost per lb N abated (in 2006\$)	Compare with up to \$10/lb of N

Cost-Effectiveness for Toxicity

	Cost (million 2006\$)	Removals (TWPE)	Cost per TWPE
ADF provisions	\$87.50	3,441	\$25,427
Pavement provisions	\$3.80	4,253	\$893
Entire proposed rule	\$91.30	7,694	\$11,866

Compare against \$857 per TWPE (in 2006 \$), highest figure among previous ELGs

Cost-Effectiveness for Conventional Pollutants

	Cost (million 2006\$)	Removals (million lbs BOD ₅)	Cost per lb Conventional Pollutants
ADF provisions	\$87.50	16.3	\$5.37
Pavement provisions	\$3.80	7.6	\$0.50
Entire proposed rule	\$91.30	23.9	\$3.82

Compare against \$0.86/lb (in 2006 \$), POTW Test part of BCT cost test

Cost-Effectiveness for Nutrients

	Cost (million 2006\$)	Removals (million lbs N)	Cost per lb Nutrients
ADF provisions	\$87.50	0	Infinite
Pavement provisions	\$3.80	3.8	\$0.99
Entire proposed rule	\$91.30	3.8	\$23.82

Compare against several \$/lb, perhaps up to \$10/lb, MPP ELG



**BEFORE THE
ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C.**

In the matter of:

Proposed rule on Effluent Limitation
Guidelines and New Source
Performance Standards for the Airport
Deicing Category

Docket No.:
EPA-HQ-OW-2004-0038

Comments of the International Air Transport Association

The International Air Transport Association (IATA) appreciates this opportunity to comment on the Environmental Protection Agency's (EPA) "Notice of Proposed Rulemaking" (EPA-HQ-OW-2004-0038)(hereinafter "NPRM"), which would impose effluent limitation guidelines (ELG) and new source performance standards on aircraft deicing at US airports.

IATA represents some 230 airlines worldwide, including the major US passenger and freight airlines. IATA's members carry 93% of the world's international scheduled traffic and include the world's leading passenger and cargo airlines. IATA's mission is to lead and serve the aviation industry by promoting safe, regular, and efficient international air transport.

General

IATA believes the EPA overlooks the significant impact this NPRM would have on domestic and international airline safety, operations and costs. Airplane deicing is a crucial, safety-sensitive industry practice, which cannot be altered without serious deliberation by industry stakeholders and the FAA. While we share the EPA's goal to improve the environmental record of the aviation industry, we believe this proposal is inapplicable to the present aviation system.

IATA fully supports the comments submitted by the Air Transport Association of America, Inc. (ATA), as well as those comments submitted by individual airlines. In addition, IATA would like to highlight several key concerns in the comments, which appear below.

Jurisdiction

In the complex aviation environment, ensuring the safety of passengers and crew must be the top priority. Congress has long recognized that the safety, efficiency and reliability of the National Air Space (NAS) depend on the application of a consistent set of regulatory requirements by the FAA, which embodies the capabilities and expertise necessary to develop and administer those requirements.

Congressional policy further recognizes that the successful integration of each airport into the overall aviation system involves aircraft operations, infrastructure, facilities, and support operations that most appropriately fall within the exclusive jurisdiction of the FAA.

Consequently, the Federal Aviation Act establishes a uniform and exclusive system of federal regulation of aircraft operations to be administered by the FAA. Congress has affirmed repeatedly its intent that the system maintain the primacy of safety while accommodating demand for air transportation to the maximum extent possible. Therefore, IATA believes the FAA must remain the sole regulatory authority over aviation.

Safety

IATA strongly believes the EPA does not give due consideration to the potential safety implications of its proposed ELG. Theses include:

- Airlines and airports may limit deicing to stay under limits: this provision may cause operators to not deice in marginal cases, which will result in an obvious reduction in safety margins
- Airports may limit use of urea to decrease discharges: this provision would reduce the frequency of the use of surface deicing and clearly increase the likelihood of runway excursions
- Requiring new facilities for new runways will most likely inhibit the construction of these needed facilities due to prohibitive costs; increased traffic on existing runways will degrade safety on those runways
- The EPA proposal to restrict the amount of ADF used to 25 gallons, without exceptions for deicing of critical airplane surfaces or for weight reasons at airports with a central facility, conflicts with existing FAA safety requirements on deicing
- Extensive use of Glycol Recovery Vehicles (GRV) could adversely impact ramp safety for already congested airport operations and complex ramp handling procedures

Operations & Environment

The NPRM does not consider the effect such a proposal would have on complex airport and airline operations. The mandates contained within the NPRM would inevitably have an effect on operations and could result in significant delays at airports, which have complex operational environments, and during bad weather conditions. Such delays will add significant operational costs to the already burdened industry in the form of additional fuel burn, staff and maintenance costs.

While some airports choose to centralize their deicing operations, this solution is not compatible in every airport environment. Therefore, at some airports, such as LGA, which are highly congested and extremely land constrained, operations could be seriously and needlessly interrupted and congested. Further, due to the extreme interconnectivity of the global aviation system, delays at one airport chronically spread out over the entire global system. Additionally, such delays would only serve to increase the impact of operations on the environment due to additional taxi and wait times.

The aviation industry has historically been supportive of the development of central deicing pads where feasible. However, the decision to introduce such facilities must be driven by measurable operational, safety, environmental and efficiency gains.

Costs

The EPA gravely underestimates the capital and operational costs of its proposals. In several erroneous calculations, the EPA underestimates the capital costs for central deicing pads by more than 50% by using seasonal departure numbers instead of annual departures as explained in the analysis by ATA. EPA makes similar mistakes in the calculations for annual O&M costs. Furthermore, EPA largely ignores the significant costs of storage of wastewater which is an important element in its proposals and which will prove particularly expensive for capacity constrained airports.

Most importantly, the EPA ignores costs incurred at individual airports to deal with specific local conditions such as the lack of available land, removal / modification of existing buildings, existing runways and taxi-tracks. Changing existing infrastructure could result in billions of additional costs to airports and airlines that are currently not considered in the EPA analysis. For example, Massport estimates that full compliance with the NPRM would cost over \$1.6 billion at Boston Logan Airport (BOS). According to Massport, additional costs to BOS are due to the need for BOS to develop new airport land to build new deicing pads and to a host of other airport-specific constraints and requirements.

The NPRM estimates that the total cost of compliance by all of the approximately 70 airports affected is \$714 million. However, compliance by BOS alone will cost over \$1.6 billion, more than twice the EPA estimate. Clearly, the EPA analysis does not accurately reflect the costs this NPRM would impose on an industry, which is starved for capital. Besides the capital and O&M costs to airports, which eventually will have to be paid by the airlines and passengers, a reasonable analysis of the additional costs of delay and the operational impact on airlines is not included in the proposed rule.

Conclusion

IATA applauds the EPA's ongoing efforts to protect the environment and shares its ambitions to continue to improve the environmental footprint of the aviation industry. However, IATA believes this proposal would have a significant impact on domestic and international airline safety, operations and costs. Safety must always remain the priority of aircraft deicing.

In the NPRM, the EPA proposes to impose similar guidelines on airport wastewater as it would impose on any other industry's waste. However, unlike other ELG industries, airplane deicing is requisite to ensure public safety and is subject to stringent regulation by the Federal Aviation Administration (FAA). Additionally, the EPA seriously underestimates the costs to airports and airlines to comply with the proposal at a time when they can least afford it. In light of the significant safety and operational concerns generated by the NPRM, IATA urges the EPA to immediately withdraw the proposed ELG.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Douglas E. Lavin".

Douglas E. Lavin
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